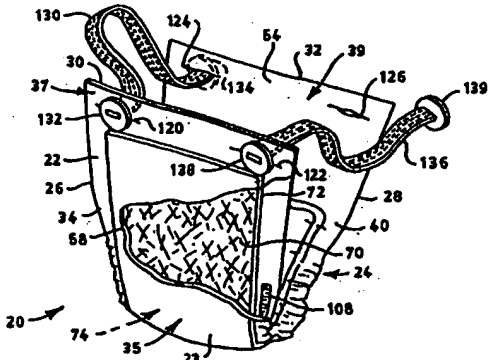


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(54) Title: ABSORBENT UNDERGARMENTS WITH IMPROVED ABSORBENCY SYSTEM			
			
(57) Abstract			
<p>A garment for using in absorbing and containing waste comprising an aqueous liquid impervious backing member having a peripheral edge, an aqueous liquid pervious body-side liner having a peripheral edge, and an absorbent pad that has been skewed forward by a factor of at least 0.27. The absorbent is disposed within the front, central, and back regions of the garment such that the length of the absorbent pad in the back region of the garment divided by the length of the absorbent pad in the front and central regions of the garment is less than 0.27 and the length of the absorbent pad in the front region of the garment is greater than the length of the absorbent pad in the back region of the garment.</p>			

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ABSORBENT UNDERGARMENTS WITH IMPROVED ABSORBENCY SYSTEM

FIELD OF THE INVENTION

This invention pertains to personal care products, more particularly to absorbent
diapers, pull-on pants, briefs and an absorbent undergarment, and even more
5 particularly, to an absorbent undergarment incorporating an absorbent pad shifted forward
for more effectively containing and absorbing body waste.

BACKGROUND OF THE INVENTION

10

Various types of garments are presently available for absorbing human discharge.
Examples of these garments include baby diapers, feminine care products, incontinence
garments and the like. Generally speaking, the basic structure of this class of garments
requires an aqueous liquid pervious body-side liner, an absorbent pad containing one or
15 more layers for receiving and absorbing the discharge, and an aqueous liquid impervious
backing member for containing the discharge.

While some of these garments perform satisfactorily for their intended purpose,
there remains the need to provide a more discrete undergarment that possesses
20 improved absorption characteristics, improved utilization of the absorbent material, as
well as improved waste containment characteristics with a minimum of discomfort to the
wearer. More specifically, heretofore, undergarments of this type have not been designed
to facilitate the transfer of aqueous liquids to the entire area, including the distal ends, of
the absorbent layer or layers. As a result, waste absorption is concentrated in a small
25 region of the absorbent layer which results in an under utilization of much of the absorbent
capacity of the undergarment.

Undergarments and most other absorbent personal care garmentlike products are
typically worn in a "J" configuration. The front region of the undergarment is worn lower
30 on the wearer's body than the back region of the undergarment. As such, the center of
the undergarment typically does not coincide with the point of insult. The point of insult

occurs toward the front region of the undergarment. The present undergarments do not adequately provide absorbent material at the point of insult. In addition, undergarments having absorbent pads that include centrally located acquisition zones do not provide the expected absorbency, resulting in product failure.

5

Heretofore, some undergarments for absorbing and containing human discharge have typically been bulky and somewhat ineffective. Typically, the absorbent pad is placed such that much of the absorbent capacity is located where it is not totally utilized and creates a configuration which is bulky, particularly in the central portion and the back region. Obviously, this style of undergarment is uncomfortable to wear, especially if the wearer is an active adult. In addition, this form of undergarment results in the costly and inefficient placement of the absorbent material in the back region where it is not used and hence wasted.

Thus, it becomes apparent that a need exists for an absorbent undergarment that improves the absorbent characteristics and the containment characteristics of the undergarment while still being comfortable to wear.

20 SUMMARY OF THE INVENTION

The present invention provides an improved absorbent undergarment having improved absorption and containment characteristics as well as improved comfort characteristics. The undergarment of the invention provides an absorbent pad disposed primarily in the front region and the central region such that the absorbent pad is not placed symmetrically in the longitudinal dimension of the garment which facilitates the formation of an adequate and comfortable garment when formed from a generally flat to an anatomically-conforming condition. In addition, the proportion (skew factor) of the absorbent pad length in the back region divided by the combined absorbent pad length of the central region plus the front region of the garment should be less than about 0.270. The undergarment also provides an elasticized design that facilitates the formation of a pouch structure in the central section, as well as an effective seal between the undergarment and the wearer, whereby the undergarment is comfortable to wear and has improved containment characteristics. The present preferred embodiment of the

invention also provides an absorbent pad that facilitates rapid aqueous liquid transfer in the x, y, and z directions by having a generally continuous and constant proportion of fiber and superabsorbent in the CD and MD directions throughout the dimensions of the absorbent pad.

5

In one form of the invention, there is provided a garment for use in absorbing and containing waste comprising a generally rectangular aqueous liquid impervious backing member having a peripheral edge, a generally rectangular aqueous liquid impervious body-side liner having a peripheral edge, wherein the body-side liner is joined to the backing member near their peripheral edges. The garment further includes a generally rectangular absorbent pad between the body-side liner and the backing member. It may be desirable to include a surge layer to contain large aqueous liquid gushes between the body-side liner and the absorbent pad, or a pledget between the absorbent pad and the backing member or both a pledget and a surge layer. Ideally the pledget and surge layer should be skewed into the front and central regions of the product and need not be present in the back region.

15

Further objects of the present invention will appear in the description hereinafter.

20

DEFINITIONS

Aqueous liquid impervious as used herein to describe a layer or laminate means that aqueous liquid such as urine will not pass through the layer or laminate under ordinary use conditions in a direction generally perpendicular to the plane of the layer or laminate at the point of aqueous liquid contact.

25

Back, back side, or back portion with reference to the human anatomy are defined by reference to Fig. 1 Fig. 3 illustrates a transverse axis or plane passing through the center of the illustrated undergarment to divide it into a front half and a back half. The "back" or "back side" or "back portion" of the wearer will include that portion from the centerline on one side of the wearer and around the back to a similar point on the other side of the wearer.

30

Back region is the back one third of the total garment length which is worn on the posterior side of the wearer's body.

5 **Barrier fabric or barrier** means a fabric which is relatively impervious to the transmission of aqueous liquids, i.e., a fabric which has blood strikethrough rate of 1.0 or less according to ASTM test method 22.

10 OR, **barrier fabric** refers to a fabric having a useful level of resistance to penetration by aqueous liquid and/or particulates. General speaking, resistance to aqueous liquid penetration is measured by hydrostatic head tests, strike-through tests, water spray penetration tests and the like. Unless otherwise specified, a material with resistance to aqueous liquid penetration refers to a material having a hydrostatic head of at least about 20 centimeters as determined in accordance with the standard hydrostatic pressure test AATCCTM No. 127-1977. For example, such a aqueous
15 liquid resistant material may have a hydrostatic head of 60 centimeters or more. Resistance to penetration by particulates may be measured by determining the air filter retention of dry particles and can be expressed as a particles holdout efficiency. In particular, particle hold-out efficiency refers to the efficiency of a material at preventing the passage of particles of a certain size range through the material.
20 Particle holdout efficiency may be measured by determining the air filter retention of dry particles utilizing tests such as, for example, IBR Test Method No. E-217, Revision G (Jan. 15, 1991) performed by InterBasic Resources, Inc. of Grass Lake, Mich. General speaking, a high particle holdout efficiency is desirable for barrier fabrics. Desirably, barrier fabrics should resist penetration by a column of tap water
25 of at least about 20 cm and/or should have a particle hold-out efficiency of at least about 40 percent for particles having a diameter greater than about 0.1 micron.

Blend means a mixture of two or more polymers while the term "alloy" means a sub-class of blends wherein the components are immiscible but have been compatibilized.
30 "Miscibility" and "immiscibility" are defined as blends having negative and positive values, respectively, for the free energy of mixing. Further, "compatibilization" is defined as the process of modifying the interfacial properties of an immiscible polymer blend in order to make an alloy.

Bonded refers to the joining, adhering, connecting, attaching, or the like, of two elements.

Two elements will be considered to be bonded together when they are bonded directly to one another or indirectly to one another, such as when each is directly bonded to intermediate elements.

5

Bonded carded web refers webs are made from staple fibers which are sent through a combing or carding unit, which breaks apart and aligns the staple fibers in the machine direction to form a generally machine direction-oriented fibrous nonwoven web. Such fibers are usually purchased in bales which are placed in a picker which separates the fibers prior to the carding unit. Once the web is formed, it then is bonded by one or more of several known bonding methods. One such bonding method is powder bonding, wherein a powdered adhesive is distributed through the web and then activated, usually by heating the web and adhesive with hot air. Another suitable bonding method is pattern bonding, wherein heated calender rolls or ultrasonic bonding equipment are used to bond the fibers together, usually in a localized bond pattern, though the web can be bonded across its entire surface if so desired. Another suitable and well-known bonding method, particularly when using bicomponent staple fibers, is through-air bonding.

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Bulk refers to the thickness of samples measured with a Model 49-70 thickness tester available from TMI (Testing Machines Incorporated) of Amityville, N.Y. The thickness tester was equipped with a 2-inch diameter circular foot and measurements were taken at an applied pressure of about 0.2 pounds per square inch (psi). Bulk measurements of samples that are substantially dry (i.e., having a moisture content generally less than about 10 percent, by weight, as determined by conventional methods) may be referred to as dry bulk.

CD direction is the cross or short direction of the product and is generally perpendicular to the MD or machine direction.

30

Cellulosic fibers refers to fibers comprising cellulose, a linear, water-wettable polysaccharide, whether existing as a single constituent in a larger natural

aggregate such as wood pulp, bagasse and cotton linters, or as a derivative of the natural aggregate such as alpha pulp or viscose rayon.

5 **Central region** is the central one third of the total garment length which is between the front and back regions of the product on the wearer's body.

Closely adjacent means one element is positioned as close to another element as can be feasibly accomplished due to other nearby structure, manufacturing restraints, comfort or fit considerations, or the like.

10 **Coform** means a process in which at least one meltblown diehead is arranged near a chute through which other materials are added to the web while it is forming. Such other materials may be pulp, superabsorbent particles, cellulose or staple fibers, for example. Coform processes are shown in commonly assigned US Patents
15 4,818,464 to Lau and 4,100,324 to Anderson et al. Webs produced by the coform process are generally referred to as coform materials.

Consisting essentially of does not exclude the presence of additional materials which do not significantly affect the desired characteristics of a given composition or
20 product. Exemplary materials of this sort would include, without limitation, pigments, antioxidants, stabilizers, surfactants, waxes, flow promoters, particulates and materials added to enhance processability of the composition.

Continuous means that the described structure is a closed-loop structure. The
25 continuous structure may be unitary, i.e., a one-piece structure, or may be made up of individual elements suitably joined together to form a closed-loop.

Disposable means that the described garment or article is designed to be used until
30 soiled, either by urination, defecation, or otherwise, and then discarded, rather than being washed and reused again;

OR disposable is not limited to single use or limited use articles but also refers to articles that are so inexpensive to the consumer that they can be discarded if they become soiled or otherwise unusable after only one or a few uses.

Disposed, disposed on, disposed with, disposed at, disposed near, or variations thereof, are intended to mean that one element can be integral or unitary with another element, or that one element can be a separate structure joined to or connected to or placed with or placed near another element.

Elastic or elastomeric when referring to a fiber, film or fabric mean a material which upon application of a biasing force, is stretchable to a stretched, biased length which is at least about 150 percent, or one and a half times, its relaxed, unstretched length, and which will recover at least 50 percent of its elongation upon release of the stretching, biasing force.

Elasticity, elastic, or elasticized refers to that property of a material or composite elastic material that permits it to recover at least a portion of its original size and shape after removal of the force causing the deformation (expressed in %).

Elasticizable describes a temporarily inhibited elasticized or elastic member that can be activated to recover its elasticity.

Elasticized means that a material that is naturally non-elastic is rendered elastic by suitably joining it to an elastic material.

Elongation means the ratio of the extension of a material to the length of the material prior to the extension (expressed as a percent), as represented by the following:
$$\text{extended length} - \text{original length} / \text{original length} \times 100.$$

Extensible, elongatable, stretch, stretchability, stretch characteristics, or variations thereof mean that the material can have its length increased (expressed in units of length).

Extension, extend, extended, or variations thereof refers to an increased change in length of a material due to stretching, and is expressed in units of length.

Fabric is used to refer to all of the woven, knitted, and nonwoven webs.

Filament refers to an element having a high ratio of length to diameter or width, and may comprise a fiber, thread, strand, yarn or the like or combination of these elements.

- 5 **Finished product** means a product that has been suitably manufactured for its intended purpose.

Flexible refers to materials that are compliant and readily conform to the general shape and contours of the human's body.

10

Front, front side, or front portion include the front part of article or garment complementary to the above-defined "back" or "back side" or "back portion".

- 15 **Front or back** are used throughout this description to designate relationships relative to the garment itself, rather than to suggest any position the garment assumes when it is positioned on a wearer.

Front Region is the forward one third of the total garment length which is worn on the anterior side of the wearer's body.

20

Fully gathered with reference to, for example, an opening or border means that the material about the opening or border is gathered along its total periphery.

- 25 **Garment** means any type of non-medically oriented apparel which may be worn. This includes industrial work wear and coveralls, undergarments, pants, shirts, jackets, gloves, socks, and the like;

30 OR, **garment** means any type of apparel which may be worn. This includes industrial work wear and coveralls, undergarments, pants, shirts, jackets, gloves, socks, and the like.

Hydrophillic describes fibers or surfaces of fibers that are wetted by the aqueous liquids in contact with the fibers. The degree of wetting of the materials can be described in terms of contact angles and the surface tensions of the liquids and materials

involved. Equipment and techniques suitable for measuring the wettability of particular fiber materials or blends of fiber materials can be provided by a Cahn SFA-222 Surface Force Analyzer System. When measured with this system, fibers having contact angles less than 90° are designated "wetable", i.e.,
5 "hydrophilic", and fibers having contact angles greater than 90° are "nonwetable", i.e., "hydrophobic".

Intake layer, intake material, or surge layer refers to a material designed to help decelerate and diffuse surges of aqueous liquid that are introduced to the
10 absorbent pad. Examples of these materials are described in U.S. Patent 5,192,606 issued March 9, 1993, to D. Proxmire et al.; U.S. Patent 5,486,166 issued January 23, 1996 to Ellis et al.; U.S. Patent 5,490,846 issued February 13, 1996 to Ellis et al.; and U.S. Patent 5,509,915 issued April 23, 1996 to Hanson et al.; the disclosures of which are hereby incorporated by reference.

15 **Integral** is used to refer to various portions of a single unitary element rather than separate structures bonded to or placed with or placed near one another.

Inward or outward refer to positions relative to the center of an absorbent garment, and
20 particularly transversely and/or longitudinally closer to or away from the longitudinal and transverse center of the absorbent garment.

Joining, join, joined, or variations thereof, when used in describing the relationship
25 between two or more elements, means that the elements can be connected together in any suitable manner, such as by heat sealing, ultrasonic bonding, thermal bonding, adhesives, stitching, or the like. Further, the elements can be joined directly together, or may have one or more elements interposed between them, all of which are connected together.

30 **Layer** when used in the singular can have the dual meaning of a single element or a plurality of elements.

Liquid means a substance and/or material that flows and will assume the interior shape of a container into which it is poured or placed. For this specification, it means an aqueous material.

5 **Liquid communication** or **Liquid migration** refer to the ability of an aqueous liquid to travel through or between (or along) two structures in the absence of an aqueous liquid impervious barrier preventing aqueous liquid travel between (or along) the two structures.

10 **Liquid impervious** when used in describing a layer or laminate including at least one aqueous liquid impervious film or layer and at least one aqueous liquid pervious film or layer means that the aqueous liquid will not pass through the laminate, under ordinary use conditions, in a direction generally perpendicular to the plane of the laminate at the point of aqueous liquid contact. Liquid may spread or be
15 transported parallel to the plane of the aqueous liquid impervious film or layer, but this is not considered to be within the meaning of "aqueous liquid impervious" when used with reference to the laminate.

OR, describe the laminate as a 2- or 3-layer laminate comprising a "aqueous
20 liquid impervious film" and a "aqueous liquid pervious layer". This avoids describing the "laminate" as aqueous liquid impervious, and relies on the aqueous liquid impervious film for its impervious feature. Note that aqueous liquid can wick/spread in the nonwoven layer and then possible over the top/distal end of the film which makes the laminate aqueous liquid "pervious" unless you use the
25 description above.

MD direction is the longitudinal or long direction of the product and is typically the direction in which the product is manufactured.

30 **Member** when used in the singular can have the dual meaning of a single element or a plurality of elements.

Microfibers means small diameter fibers having an average diameter not greater than about 75 microns, for example, having an average diameter of from about 0.5

microns to about 50 microns, or more particularly, microfibers may have an average diameter of from about 2 microns to about 40 microns. Another frequently used expression of fiber diameter is denier, which is defined as grams per 9000 meters of a fiber and may be calculated as fiber diameter in microns squared, multiplied by the density in grams/cc, multiplied by 0.00707. A lower denier indicates a finer fiber and a higher denier indicates a thicker or heavier fiber. For example, the diameter of a polypropylene fiber given as 15 microns may be converted to denier by squaring, multiplying the result by .89 g/cc and multiplying by .00707. Thus, a 15 micron polypropylene fiber has a denier of about 1.42 ($15^2 \times 0.89 \times .00707 = 1.415$). Outside the United States the unit of measurement is more commonly the "tex", which is defined as the grams per kilometer of fiber. Tex may be calculated as denier/9.

Monocomponent fiber refers to a fiber formed from one or more extruders using only one polymer. This is not meant to exclude fibers formed from one polymer to which small amounts of additives have been added for coloration, anti-static properties, lubrication, hydrophilicity, etc. These additives, e.g. titanium dioxide for coloration, are generally present in an amount less than 5 weight percent and more typically about 2 weight percent.

Multilayer laminate means a laminate wherein some of the layers are spunbond and some meltblown such as a spunbond/meltblown/spunbond (SMS) laminate and others as disclosed in U.S. Patent 4,041,203 to Brock et al., U.S. Patent 5,169,706 to Collier, et al, US Patent 5,145,727 to Potts et al., US Patent 5,178,931 to Perkins et al. and U.S. Patent 5,188,885 to Timmons et al. Such a laminate may be made by sequentially depositing onto a moving forming belt first a spunbond fabric layer, then a meltblown fabric layer and last another spunbond layer and then bonding the laminate in a manner described below. Alternatively, the fabric layers may be made individually, collected in rolls, and combined in a separate bonding step. Such fabrics usually have a basis weight of from about 0.1 to 12 osy (6 to 400 gsm), or more particularly from about 0.75 to about 3 osy. Multilayer laminates may also have various numbers of meltblown layers or multiple spunbond layers in many different configurations and may include other materials like films (F) or coform materials, e.g. SMMS, SM, SFS, etc.

Non-elastic refers to any material that does not fall within the definition of "elastic".

Nonwoven fabric or nonwoven web means a web having a structure of individual fibers or threads which are interlaid, but not in an identifiable manner as in a knitted fabric. Nonwoven fabrics or webs have been formed from many processes such as for example, meltblowing processes, spunbonding processes, and bonded carded web processes. The basis weight of nonwoven fabrics is usually expressed in ounces of material per square yard (osy) or grams per square meter (gsm) and the fiber diameters useful are usually expressed in microns. (Note that to convert from osy to gsm, multiply osy by 33.91).

Nonwoven web means a web of material which is formed without the aid of a textile weaving or knitting process.

OR, means a web having a structure of individual fibers or threads that are interlaid, but not in any identifiable, repeating pattern. Nonwoven webs have been, in the past, formed by a variety of processes such as, for example, meltblowing processes, spunbonding processes, and bonded carded web processes.

OR, means a web of material which is formed without the aid of a textile weaving or knitting process. Nonwoven webs have been formed from many processes such as for example, meltblowing processes, spunbonding processes, and bonded carded web processes. The basis weight of nonwoven fabrics is usually expressed in ounces of material per square yard (osy) or grams per square meter (gsm) and the fiber diameters useful are usually expressed in microns.

Operatively joined, elastically associated, or associated with with reference to the attachment of an elastic member to another element means that the elastic member when attached to or placed with or formed from the element gives that element elastic properties. With reference to the attachment of a non-elastic member to another element, it means that the member and element can be attached or placed together in any suitable manner that allows or permits them to

perform their intended or described function, while not completely inhibiting the properties of the individual elements. The attaching or placing can be either directly, such as attaching or placing either member directly with an element, or can be indirectly by means of another member or element disposed between the first member and the first element. OR, describes the joining of an elastic member to a non-elastic member such that the two joined members exhibit elasticity or elastic properties.

OR **operatively joined**, with reference to the attachment of an elastic member to another element, means that the elastic member when attached to or connected to the element, or treated with heat or chemicals, by stretching, or the like, gives the element elastic properties; and with reference to the attachment of a non-elastic member to another element, means that the member and element can be attached in any suitable manner that permits or allows them to perform the intended or described function of the joinder. The joining, attaching, connecting or the like can be either directly, such as joining either member directly to an element, or can be indirectly by means of another member disposed between the first member and the first element.

Outward refers to a position relative to the center of an absorbent garment, and particularly transversely and/or longitudinally away from the longitudinal and transverse center of the absorbent.

Partially elastic refers to a substrate, garment, a part of a garment, or the like, having at least one portion thereof that is elastic.

Particles as in SAP or SAM means any geometric or non-geometric form such as, but not limited to, spherical grains, cylindrical fibers or strands, flat surfaces or roughened surfaces, sheets, ribbons, strings, strands, or the like. When used in an absorbent structure, the particles can be loosely formed into a shaped structure or compressed into a shaped form.

Permeable or permeability (also pervious) refer to the ability of a aqueous liquid, such as, for example, a gas to pass through a particular porous material. Permeability

may be expressed in units of volume per unit time per unit area, for example, cubic feet per minute) per square foot of material (e.g., ft³/minute/ft²).

Permeability was determined utilizing a Frazier Air Permeability Tester available from the Frazier Precision Instrument Company and measured in accordance with Federal Test Method 5450, Standard No. 191A, except that the sample size was 8"x8" instead of 7"x7". Although permeability is generally expressed as the ability of air or other gas to pass through a permeable sheet, sufficient levels of gas permeability may correspond to levels of aqueous liquid permeability to enable the practice of the present invention. For example, a sufficient level of gas permeability may allow an adequate level of aqueous liquid to pass through a permeable sheet with or without assistance of a driving force such as, for example, an applied vacuum or applied gas pressure.

Personal care product means diapers, training pants, absorbent underpants, adult incontinence products, and feminine hygiene products;

OR, **personal care product** means diapers, training pants, absorbent underpants, adult incontinence products, and feminine hygiene products and the like.

Polymer generally includes but is not limited to, homopolymers, copolymers, such as for example, block, graft, random and alternating copolymers, terpolymers, etc. and blends and modifications thereof. Furthermore, unless otherwise specifically limited, the term "polymer" shall include all possible geometrical configurations of the molecule. These configurations include, but are not limited to isotactic, syndiotactic and random symmetries.

Pulp refers to pulp containing fibers from natural sources such as woody and non-woody plants. Woody plants include, for example, deciduous and coniferous trees. Non-woody plants include, for example, cotton, flax, esparto grass, milkweed, straw, jute hemp, and bagasse.

Releasably attached, releasably bonded, releasably engaged or variations thereof refer to two elements being connected or connectable such that the elements tend to remain connected absent a separation force applied to one or both of the

elements, and the elements being capable of separation without substantial permanent deformation or rupture. The required separation force is typically beyond that encountered while wearing the absorbent garment.

- 5 **Retraction** or variations thereof refers to a decreasing change in length of an extended material upon removal of the force causing the extension.

Side refers to a position in which a side of the body faces the supporting surface.

- 10 **Spunbonded fibers** refers to small diameter fibers which are formed by extruding molten thermoplastic material as filaments from a plurality of fine, usually circular capillaries of a spinneret with the diameter of the extruded filaments then being rapidly reduced as by, for example, in US Patent 4,340,563 to Appel et al., and US Patent 3,692,618 to Dorschner et al., US Patent 3,802,817 to Matsuki et al., US Patents 3,338,992
15 and 3,341,394 to Kinney, US Patent 3,502,763 to Hartman, and US Patent 3,542,615 to Dobo et al. Spunbond fibers are generally not tacky when they are deposited onto a collecting surface. Spunbond fibers are generally continuous and have average diameters (from a sample of at least 10) larger than 7 microns, more particularly, between about 10 and 20 microns.

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Staple fiber refers to a natural fiber or a length cut from, for example, a manufactured filament. Staple fibers typically have a length between about 3 and about 7.5 millimeters.

- 25 **Stretch bonding** refers to a process wherein an elastic member is bonded to another member while only the elastic member is extended at least about 25 percent of its relaxed length. "Stretch bonded laminate" refers to a composite elastic material made according to the stretch bonding process, i.e.: the layers are joined together when only the elastic layer is in an extended condition so that upon relaxing the
30 layers, the nonelastic layer is gathered. Such laminates usually have machine directional stretch properties and may be stretched to the extent that the nonelastic material gathered between the bond locations allows the elastic material to elongate. One type of stretch bonded laminate is disclosed, for example, by US Patent 4,720,415 to Vander Wielen et al., in which multiple layers of the same

polymer produced from multiple banks of extruders are used. Other composite elastic materials are disclosed in US Patent 4,789,699 to Kieffer et al. , US Patent 4,781,966 to Taylor and US Patents 4,657,802 and 4,652,487 to Morman and 4,655,760 to Morman et al.

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Substrates, surface, or sheet means a **Layer** that may be a film or woven web or nonwoven web, a laminate; pervious or impervious to air, gas, and/or aqueous liquids; or a composite structure comprising for example a topsheet, backsheet, and an absorbent medium therebetween.

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Superabsorbent refers to absorbent materials capable of absorbing at least 10 grams of aqueous liquid (e.g. distilled water per gram of absorbent material while immersed in the liquid for 4 hours and holding substantially all of the absorbed aqueous liquid while under a compression force of up to about 1.5 psi.

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Surface includes any layer, film, woven, nonwoven, laminate, composite, or the like, whether pervious or impervious to air, gas, and/or aqueous liquids.

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Surge layer refers to a material designed to help decelerate and diffuse surges of aqueous liquid that are introduced to the absorbent pad. Examples of surge materials are described in U.S. Patent 5,192,606 issued March 9, 1993, to D. Proxmire et al.; U.S. Patent 5,486,166 issued January 23, 1996 to Ellis et al.; U.S. Patent 5,490,846 issued February 13, 1996 to Ellis et al.; and U.S. Patent 5,509,915 issued April 23, 1996 to Hanson et al.; the disclosures of which are

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hereby incorporated by reference.

Tension refers to a force tending to cause the extension of a body, or to the balancing force within that body resisting the extension. Tension is expressed in units of grams.

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Thermoplastic describes a material that softens when exposed to heat and which substantially returns to a nonsoftened condition when cooled to room temperature.

Through-air bonding or TAB means a process of bonding a nonwoven bicomponent fiber web in which air which is sufficiently hot to melt one of the polymers of which the fibers of the web are made is forced through the web. The air velocity is between 100 and 500 feet per minute and the dwell time may be as long as 6 seconds. The melting and resolidification of the polymer provides the bonding. Through air bonding has relatively restricted variability and since through-air bonding TAB requires the melting of at least one component to accomplish bonding, it is restricted to webs with two components like conjugate fibers or those which include an adhesive. In the through-air bonder, air having a temperature above the melting temperature of one component and below the melting temperature of another component is directed from a surrounding hood, through the web, and into a perforated roller supporting the web. Alternatively, the through-air bonder may be a flat arrangement wherein the air is directed vertically downward onto the web. The operating conditions of the two configurations are similar, the primary difference being the geometry of the web during bonding. The hot air melts the lower melting polymer component and thereby forms bonds between the filaments to integrate the web.

Two-dimensional refers to a garment, such as a diaper, that can be opened and laid in a flat condition without destructively tearing any structure. This type of garment does not have continuous leg and waist openings when opened and laid flat, and requires a refastening device, such as adhesive tapes, to attach about the wearer.

Undergarment refers to a substantially rectangular adult incontinence absorbent product suspended from the wearer by straps attached to the waist regions of the product. Examples are commercially available DEPEND® Elastic Leg Undergarments.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a perspective view of a specific embodiment of the invention with a portion of the liquid impervious backing removed to expose the interior structure of the embodiment;

Figure 2 is a plan view of the specific embodiment of **Figure 1** in an extended condition with the liquid pervious liner facing the viewer, and a portions of the liquid pervious liner and a portion of the absorbent layer removed;

- 5 **Figure 3** is a cross-sectional view of the specific embodiment of **Figure 2** taken along section line 3-3 of **Figure 2**;

Figure 3a is a cross-sectional view of an alternate embodiment of **Figure 2** taken along section line 3-3 of **Figure 2**;

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Figure 4a is a perspective view of the specific embodiment of the invention with a portion of the liquid impervious backing removed to expose the interior structure of the embodiments;

- 15 **Figure 4b** is a plan view of the specific embodiment of **Figure 4a** in an extended condition with the liquid pervious liner facing the viewer, and a portions of the liquid pervious liner and a portion of the absorbent layer removed; and,

- 20 **Figure 4c** is a cross-sectional view of the specific embodiment of **Figure 2** taken along section line 3-3 of **Figure 4b**.

Figure 5 is a cross-sectional view of the absorbent pad taken along section line 3-3 of **Figure 2** and which shows a homogeneous distribution of fibrous and high absorbency material.

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Figure 5A is a cross-sectional view of the absorbent pad taken along section line 3-3 of **Figure 2** and which shows a homogeneous distribution of fibrous and high absorbency material which has a profiled basis weight distribution.

- 30 **Figure 6** is a cross-sectional view of the absorbent pad taken along section line 2-2 of **Figure 2** and which shows a homogeneous distribution of fibrous and high absorbency material.

Figure 7 is a cross-sectional view of the absorbent pad taken along section line 3-3 of **Figure 2** and which shows a layered distribution of fibrous and high absorbency material

Figure 7A is a cross-sectional view of the absorbent pad taken along section line 2-2 of **Figure 2** and which shows a pulsed distribution of fibrous and high absorbency material with little high absorbency material in the ends.

Figure 7B is a cross-sectional view of the absorbent pad taken along section line 3-3 of **Figure 2** and which shows a non-uniform distribution of fibrous and high absorbency material in the cross direction of the absorbent pad.

Figure 8 is an expanded plan view of undergarment with a symmetrical placement of the absorbent pad.

Figure 9 is an expanded plan view of undergarment with a skewed forward placement of the absorbent pad in the MD direction.

Figure 10 is an expanded plan view of undergarment with a skewed forward placement of the absorbent pad and a high basis weight pocket in the MD direction.

Figure 11 is an expanded plan view of a pant with a skewed forward placement of the absorbent pad.

Figure 12 is an expanded plan view of a pant with a skewed forward placement of a profile absorbent pad.

DESCRIPTION OF SPECIFIC EMBODIMENTS

Referring to **Figures 1** through **3**, there is illustrated one specific embodiment of the invention generally designated as **20**. The garment **20** includes an aqueous liquid impervious backing member **22** that is of generally rectangular shape. The garment **20**

has a peripheral edge 24 which includes side edges 26 and 28, a front edge 30 and a back edge 32.

The absorbent garment 20 comprises a backing member 22, a substantially aqueous liquid pervious body-side liner 40, and an absorbent pad 58 sandwiched between the backing member 22 and the body-side liner 40 superimposed on the outer member 38 (see Figures 1,2,3,3a, 4a, 4b, and 4c). An undergarment as shown in the figures is simply one embodiment of the present invention. The backing member 22 and the body-side liner 40 are desirably longer and wider than the absorbent pad 58, so that the peripheries of the backing member 22 and the body-side liner 40 form margins which may be sealed together using ultrasonic bonds, thermal bonds, adhesives, or other suitable means. In this sealed area, the leg elastics 96 and 108 may be incorporated between the backing member 22 and the body-side liner 40. The absorbent pad 58 may be attached to the backing member 22 and/or the body-side liner 40 using ultrasonic bonds, adhesives, or other suitable means. (See Figures 1 and 2). In some embodiments, the absorbent garment 20 also include an outer member 38. The outer member 38 is attached to the backing member 22 using ultrasonic bonds, adhesives, or other suitable means. The body-side liner 40 is designed to be positioned toward the wearer and is referred to as the body facing surface 21 of the undergarment 20. Conversely, the backing member 22 is designed to be positioned toward the outer member 38 and the outer clothing of the wearer and is referred to as the garment facing surface 23 of garment 20.

The garment 20 can be constructed by supplying the body-side liner 40 and the backing member 22 materials and sandwiching an individual absorbent pad 58 between the backing member 22 and the body-side liner 40. The side and end peripheries of the backing member 22 and the body-side liner 40 outward of the absorbent pad 58 can be joined, forming the central region 35, the front region 37, and the back region 39, and sealed together. Referring to Figures 8, 9, 10, 11, and 12, for the purposes of this invention the central region 35 is the center one third of the total product length falling between lines 4 - 4 and 5 - 5. The front region 37 is the one third of the total product length of the garment 20 that falls between line 4 - 4 and the front end edge 30 of the garment 20 and which is typically worn against the anterior side of the wearer's body. The back region 39 of the garment 20 is that one third of the length of the garment 20 between line 5 -5 and the back

end edge 32 of the garment 20 and is typically worn against the posterior side of the wearer's body. The absorbent pad 58 may optionally be T-shaped, I-shaped, oval-shaped, hourglass-shaped, rectangular-shaped, or irregularly-shaped. In addition, the absorbent pad 58 may also include leg cutouts 900, opposing indentations in the longitudinal sides 62 and 64 of the absorbent pad 58. The leg cutouts 900 may improve the fit of the garment 20 as the reduced bulk between the wearer's legs reduces or prevents gapping, thereby preventing leaks as well as improving comfort. The other materials used in the garment 20, including but not limited to the body-side liner 40, the backing member 22, and outer member 38 may also be shaped to include leg cutouts 900. However, in some embodiments, it may be desirable for the absorbent pad 58 to be shaped to include leg cutouts 900, and not shape the other materials, including the body-side liner 40, the backing member 22, and the outer member 38, to include leg cutouts 900. The absorbent pad 58, leg cutouts 900, and leg elastic 96 and 108 are not typically placed symmetrically in garment 20 but are skewed toward the front end edge 30 of garment 20.

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Throughout the specification, the term "generally rectangular" is used by the applicants. However, it is not intended that this term be limited to only a rectangular shape. But, instead, this term can include geometric shapes that are rectangular, oval or racetrack patterns, hourglass configurations, bilobal shapes, and in general any shape where the length is greater or less than the width.

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The backing member 22 is needed to prevent aqueous liquid strike through to the outer clothing when discharge occurs onto the absorbent pad 58 of the garment 20. The backing member 22 is located on the inside of the outer member 38 of the garment 20 and typically consists of an aqueous liquid impervious film such as polyethylene. The aqueous liquid impervious backing member 22 has an exterior surface 34 that faces away from the wearer and an interior surface 36 that faces toward the wearer. In construction of the garment 20, the backing member 22, acting as a barrier, should retard the movement of the aqueous liquid through the garment 20 by making the backing member 22 resistant to penetration normally encountered under wearing conditions. The backing member 22 desirably comprises a material that is formed or treated to be aqueous liquid impervious. Alternatively, the backing member 22 may comprise an aqueous liquid pervious material and other suitable means (not shown), such as an aqueous liquid impervious layer associated with the absorbent pad 58 may be provided to impede

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aqueous liquid movement away from the absorbent pad 58. The garment 20 may be rendered aqueous liquid impervious by any method well known in the art such as coating the absorbent pad 58 or by securing a separate aqueous liquid impervious material to the absorbent pad 58. The backing member 22 may comprise a thin, aqueous liquid
5 impervious web or sheet of plastic film such as polyethylene, polypropylene, polyvinyl chloride or similar material. Other acceptable materials include a single spunbonded layer of the above types of materials, two layers of spunbonded and meltblown materials or a three-layer material of spunbonded- meltblown-spunbonded material. Suitable foam materials may also be used, as well as materials that are both aqueous liquid impervious
10 and vapor-pervious.

Alternately, the backing member 22 may comprise a nonwoven, fibrous web which has been suitably constructed and arranged to have low aqueous liquid perviousness. Still alternately, the backing member 22 may comprise a layered or
15 laminated material, such as a thermally bonded plastic film and nonwoven web composite. Alternatively, the backing member 22 consists of a aqueous liquid impervious film or foam which is pervious to water vapor under normal wearing conditions. More preferred, the backing member 22 has a water vapor transmission rate of at least about 800 grams/m²/24 hours measured by ASTM E96-92. One example of a suitable film is a 39.4
20 grams per square meter microporous film produced by Mitsui and sold by Consolidated Thermoplastics (CT) under the tradename of ESPOIR® N-TAF-CT.

The outer member 38 is compliant and soft feeling to the wearer. The outer member 38 may be any soft, flexible, porous sheet which is aqueous liquid pervious,
25 permitting aqueous liquids to readily penetrate into its thickness, or impervious, resistant to the penetration of aqueous liquids into its thickness. A suitable outer member 38 may be manufactured from a wide range of materials, such as natural fibers (e.g., wood or cotton fibers), synthetic fibers (e.g., polyester or polypropylene fibers) or from a combination of natural and synthetic fibers or reticulated foams and apertured plastic
30 films.

There are a number of manufacturing techniques which may be used to manufacture the outer member 38. For example, the outer member 38 may be woven or nonwoven web or sheet such as a spunbond, meltblown or bonded-carded web

composed of synthetic polymer filaments, such as polypropylene, polyethylene, polyesters or the like, or a web of natural polymer filaments such as rayon or cotton. The bonded-carded web may be thermally bonded or sprayed with a binder by means well known to those skilled in the fabric art. Suitably, the outer member 38 is a nonwoven spunbond.

- 5 Ideally, the outer member 38 is a spunbond polypropylene nonwoven with a wireweave bond pattern. Suitably, the spunbond material is available from Kimberly-Clark Corporation, located in Roswell, GA. The outer member 38 has a weight from about 0.3 oz. per square yard (osy) to about 2.0 osy and alternatively about 0.6 osy. The outer member 38 of the garment 20 may be printed, colored or decoratively embossed. The
10 outer member 38 has a pore size that readily allows the passage therethrough of air, sweat, and perspiration due to the breathability of the material. The outer member 38 may be selectively embossed or perforated with discrete slits or holes extending therethrough.

- 15 The garment 20 further includes a generally rectangular aqueous liquid pervious body-side liner 40 that is of approximately the same dimension as aqueous liquid impervious backing member 22 (See Figures 2, 3, and 3a). The aqueous liquid pervious body-side liner 40 has a peripheral edge 42 comprising a front edge 44, a back edge 46, and side edges 48 and 50. The aqueous liquid pervious body-side liner 40 has an exterior
20 surface 52 that faces away from the wearer and an interior surface 54 that faces towards the wearer.

- The body-side liner 40 consists of a nonwoven or other soft material for contacting the wearer's skin. The body-side liner 40 is described in more detail below. The body-
25 side liner 40 is compliant and soft feeling to the wearer. The body-side liner 40 may be any soft, flexible, porous sheet which is aqueous liquid pervious, permitting aqueous liquids to readily penetrate into its thickness. A suitable body-side liner 40 may be manufactured from a wide range of materials, such as natural fibers (e.g., wood or cotton fibers), synthetic fibers (e.g., polyester or polypropylene fibers) or from a combination of
30 natural and synthetic fibers or reticulated foams and apertured plastic films.

The body-side liner 40 is formed of a aqueous liquid pervious material so that aqueous liquid waste, and possibly semi-solid waste as well, can pass through to the absorbent pad 58 and be absorbed by the absorbent pad 58. A suitable body-side liner

40 may be comprised of a nonwoven web, a spunbond, meltblown or bonded-carded web composed of synthetic polymer filaments or fibers, such as polypropylene, polyethylene, polyesters or the like, a perforated film, or a web of natural polymer filaments or fibers such as rayon or cotton. In addition, the body-side liner 40 may be treated with a
5 surfactant to aid in aqueous liquid transfer. Suitably, the body-side liner 40 is a nonwoven spunbond. Suitably, the spunbond material is available from Kimberly-Clark Corporation, located in Roswell, GA. The body-side liner 40 has a weight from about 0.3 oz. per square yard (osy) to about 2.0 osy and alternatively about 0.5 osy. The body-side liner 40 of the underpant maybe printed, colored or decoratively embossed. The body-side liner
10 40 can also be a nonwoven web or sheet of polyolefin fibers, such as polypropylene, polyester, polyethylene, Rayon, chisso and the like. The body-side liner 40 may also be a plastic film with perforations, an expanded plastic webbing material or a scrim material. The body-side liner 40 has a pore size that readily allows the passage therethrough of air, sweat, perspiration due to the breathability of the material. The body-side liner 40 may be
15 selectively embossed or perforated with discrete slits or holes extending therethrough.

Ideally, the fabric of the body-side liner 40 is surface treated with a surfactant such as that commercially available from Union Carbide Chemicals and Plastics Company, Inc., of Danbury, Connecticut, U.S.A. under the trade designation TRITON X-102. As used
20 herein, the term "fabric" refers to all of the woven, knitted and nonwoven fibrous webs. The term "nonwoven web" means a web of material that is formed without the aid of a textile weaving or knitting process.

As an alternate material, an aqueous liquid pervious body-side liner 40 can be
25 made of a carded web of polyester fibers bonded to a spunbonded polypropylene or polyethylene carrier sheet. The carded material is made up of about 20 to about 60 weight percent polypropylene or polyethylene and about 80 to about 40 weight percent polyester. The basis weight of this material can be between about 30 gsm and about 70 gsm.

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The aqueous liquid impervious backing member 22 and aqueous liquid pervious body-side liner 40 are joined near their respective peripheral edges 24 and 42 to form what can be considered to be a container, generally designated as 74, that defines an

interior volume of the garment 20. This interior volume, the container 74, contains the remaining structure of the garment 20, which comprises an absorbent pad 58.

The aqueous liquid impervious backing member 22 and the aqueous liquid pervious body-side liner 40 have essentially the same width and length. The width of the backing member 22 and the body-side liner 40 ranges between about 4 inches (102 mm) and 10 inches (254 mm), more preferably between about 5 inches (127 mm) and about 10 inches (254 mm) and most preferably between about 5 inches (127 mm) and about 9 inches (229 mm). The length of backing member 22 and the body-side liner 40 ranges between about 15 inches (381 mm) and 40 inches (1016 mm) more preferably between about 21 inches (533 mm) and about 29 inches (737 mm), most preferably between about 23 inches (584 mm) and about 28 inches (711 mm). In the specific embodiment of the invention, as illustrated in Figures 1-3 and 3a, the width of the backing member 22 and the body-side liner 40 is about 9 inches (229 mm), and the length is about 27 inches (687 mm).

ABSORBENT PAD SECTION

Referring to Figures 1, 2, 4a, and 4b, the absorbent pad 58 is of a generally rectangular shape and includes a peripheral edge 60 comprised of side edges 62 and 64 a front end edge 66 and a back end edge 68. The absorbent pad 58 has an exterior surface 70 that faces away from the wearer, and an interior surface 72 that faces towards the wearer.

The porous fibrous matrix of absorbent pad 58 is preferably an air laid batt of fluff and high absorbency material which may be formed in many ways, for example according to the teaching of Mazurak and Fries as set forth in U.S. Patent 4,381,782 the entire disclosure of which is incorporated herein by reference. Referring to Figures 5, 5A, 6, 7, 7A, and 7B. The absorbent pad 58 can comprise an airformed mixture of high absorbency material (SAP) 202 and fibers 201, preferably of fluff pulp. Most preferably, as shown in Figures 5, 5a, and 6, the mixing of the fluff fibers 201 and the high absorbency material 202 is homogeneous. Less preferable, as shown in Figures 7, 7a, and 7b, the mixtures can be layered (see Figure 7), phased to place the high absorbency material 202 in a specific machine direction location (see Figure 7a), or placed in a narrow band in

the cross direction (see **Figure 7b**), or both. Also, the fibers **201**, other than fluff pulp such as chemically stiffened and thermomechanical pulps, can be used. In addition, the absorbent pad **58** can comprise absorbent material **201** other than air formed fluff **201** and SAP **202**. For example, coform materials as referenced in US Patents 4,818,464 to Lau
5 and 4,100,324 to Anderson can be used to make the absorbent as long as they also contain high absorbency materials. In addition, wet formed composite materials comprising a combination of fibers and high absorbency materials as disclosed in US Patent 5,651,862 to Anderson et. al. can also be used. Stabilized airlaid materials comprising a mixtures of fibers, binder fibers, and high absorbency materials which are
10 bound together by latex binding or through air bonding are also usable as absorbent materials. Additionally, any material known in the art that serves to absorb body exudates can be used to construct the absorbent pad **58** as shown in the present invention.

The high absorbency materials **202** are typically hydrogel polymers that are desirably
15 sufficiently cross-linked to render the materials substantially water-insoluble. Cross-linking may, for example, be by irradiation or by covalent, ionic, van der Waals or hydrogen bonding. Suitable materials **202** are available from various commercial vendors, such as Dow Chemical Company (Drytech 2035 LD), Hoechst-Celanese Corporation and Allied-Colloid. Typically, the high-absorbency material **202** is capable of absorbing at least about
20 15 times its weight in water, and desirably is capable of absorbing more than about 25 times its weight in water.

The high-absorbency material **202** can be distributed or otherwise incorporated into the absorbent pad **58** employing various techniques. For example, as illustrated in **Figures**
25 **5, 6, 7, 7a, and 7b**, the high-absorbency material **202** can be substantially uniformly distributed among the fibers **201** comprising the absorbent pad **58**. The materials **202** can also be non-uniformly distributed within the fibers **201** of the absorbent pad **58** to form a generally continuous gradient with either an increasing or decreasing concentration of high-absorbency material **202**, as determined by observing the concentration moving inward
30 from the backing member **22**. Alternatively, the high-absorbency material can comprise a discrete layer separate from the fibers **201** of the absorbent pad **58**, or can comprise a discrete layer integral with the absorbent pad **58**.

The absorbent pad 58 may also include a wrap layer 80 to help maintain the integrity of the fibrous absorbent pad 58 (See Figure 3a). This wrap layer 80 may comprise a cellulosic tissue or spunbond, meltblown or bonded-carded web material composed of synthetic polymer filaments, such as polypropylene, polyethylene, polyesters or the like or
5 natural polymer filaments such as rayon or cotton.

The absorbent pad 58 should have an aqueous liquid capacity great enough to absorb discharges from about 10 grams to about 1500 grams. The absorbent pad 58 should preferably have a capacity (described below) and a thickness preferably less than
10 about 25 mm, thus providing a non-bulky and flexible fit. The capacity of the absorbent pad 58 should have a total capacity of about 200 grams to about 1300 grams. Preferably, the absorbent pad 58 should have a total capacity of at least about 300 grams and not more than about 1200 grams. More preferably, the total capacity of the absorbent pad 58 should be from about 400 grams to about 800 grams.

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The total capacity of the absorbent pad 58 is determined using the absorbent pad 58 of the garment 20, the body-side liner 40, the backing member 22, and the outer member 38. The saturated retention capacity is a measure of the total absorbent capacity of an absorbent garment 20, in this case an undergarment 20. The saturated retention
20 capacity is determined as follows. The undergarment 20 to be tested, having a moisture content of less than about 7 weight percent, is weighed and submerged in an excess quantity of the room temperature (about 23° C) saline solution described below. The material is allowed to remain submerged for 20 minutes. After 20 minutes the undergarment 20 is removed from the saline solution and placed on a Teflon™ coated
25 fiberglass screen having 0.25 inch openings (commercially available from Taconic Plastics Inc., Petersburg, N.Y.) which, in turn, is placed on a vacuum box and covered with a flexible rubber dam material. A vacuum of 3.5 kilopascals (0.5 pounds per square inch) is drawn in the vacuum box for a period of 5 minutes. The undergarment 20 is weighed again. The amount of aqueous liquid retained by the material being tested is determined
30 by subtracting the dry weight of the undergarment 20 from the wet weight of the undergarment 20 (after application of the vacuum) and is reported as the saturated retention capacity in grams of aqueous liquid retained.

The saline solution is an aqueous solution of about 0.9 percent sodium chloride by weight. A suitable product is S/P™ Certified Blood Saline commercially available from Baxter Diagnostics in McGaw Park, Illinois.

- 5 The absorbent pad 58 comprises materials adapted to absorb and retain urine, menses, blood, or other body excrement. The absorbent pad 58 may comprise various natural or synthetic absorbent materials, such as cellulose fibers, surfactant treated meltblown fibers, wood pulp fibers, regenerated cellulose or cotton fibers, a blend of pulp and other fiber, or the like. The absorbent pad 58 may also include compounds to
- 10 increase its absorbency, such as 0 - 95 weight percent of organic or inorganic high-absorbency materials, which are typically capable of absorbing at least about 15 and desirably more than 25 times their weight in water. Organic high-absorbency materials can include natural materials, such as pectin, guar gum and peat moss, as well as synthetic materials, such as synthetic hydrogel polymers. Such hydrogel polymers may include, for
- 15 example, carboxymethylcellulose, alkali metal salts of polyacrylic acids, polyacrylamides, polyvinyl alcohol, ethylene maleic anhydride copolymers, polyvinyl ethers, hydroxypropyl cellulose, polyvinyl morpholinone, polymers and copolymers of vinyl sulfonic acid, polyacrylates, polyacrylamides, polyvinyl pyridine or the like. Other suitable polymers can include hydrolyzed acrylonitrile grafted starch, acrylic acid grafted starch, and isobutylene
- 20 maleic anhydride copolymers, and mixtures thereof. Suitable high-absorbency materials are described in U.S. Patents 4,699,823 issued October 13, 1987, to Kellenberger et al. And 5,147,343 issued September 15, 1992 to Kellenberger, which are incorporated herein by reference. High absorbency materials are available from various commercial vendors, such as Dow Chemical Company, Stockhausen, Inc., Hoechst Celanese Corporation, and
- 25 Allied Colloids, Inc. The absorbent pad 58 may also include tissue layers or acquisition or distribution layers to help maintain the integrity of fibrous absorbents or transport aqueous liquids.

- 30 The absorbent undergarment 20 may also include additional components to assist in the acquisition, distribution, and storage of body exudates. For example, the absorbent undergarment 20 may include a transport layer, such as described in U.S. Patent 4,798,603 issued January 17, 1989, to Meyer et al., or a surge management layer, such as described in U.S. Patent 5,486,166 issued January 23, 1996, to Bishop et al., U.S. Patent 5,364,382 issued November 15, 1994, to Latimer et al., U.S. Patent 5,490,846 to Ellis et al., U.S. patent

5,429,629 to Latimer et.al., U.S. Patent 5,509,915 to Hanson et.al., U.S. Patent 5,192,606 to Proxmire et.a., and European Patent Application EP 0 539 703 A1, published May 5, 1993, which the patents and application are incorporated herein by reference. Such layers are also referred to as acquisition/distribution layers. A surge layer would be positioned within
5 about 0 inch (0 cm) to about 4 inches (10.2 cm) from the front end edge 66 of the absorbent pad 58, more typically from about 0 inch (0 cm) to about 2 inches (5.1 cm) from the front end edge 66 of the absorbent pad 58 and most typically from about 0 inch (0 cm) to about 1 inch (2.5 cm) from the front end edge 66 of the absorbent pad 58.

10 The length of the surge layer is typically between about 5 inches (12.7 cm) and about 19 inches (48.3 cm), more typically between about 8 inches (20.3 cm) and about 16 inches (40.6 cm), and most typically between about 10 inches (25.4 cm) and about 14 inches (35.6 cm). The length of the surge layer is generally about 12 inches (30.5 cm).

15 The acquisition/distribution layer 78 is disposed on the aqueous liquid storage layer 76 toward the body-facing surface 21 of the absorbent pad 58 to help decelerate and diffuse surges of aqueous liquid that may be introduced into the absorbent pad 58. The acquisition/distribution layer 78 may comprise a through-air bonded carded web composed of a blend of 40 percent 6 denier polyester fibers, commercially available from
20 Hoechst Celanese Corporation, and 60 percent 3 denier polypropylene/polyethylene sheath core bicomponent fibers, commercially available from the Chisso Corporation, with an overall basis weight ranging of from about 50 gsm and about 120 gsm.

One suitable absorbent pad 58 comprises an aqueous liquid storage layer 76 in
25 which the basis weight of the absorbent components, such as fluff, pulp, and superabsorbent (SAP), are generally continuous throughout the MD length of the absorbent pad 58. The distribution of the absorbent components are substantially homogeneous in at least the y-direction, preferably in the x- and y-directions and may be homogeneous in the z-direction within the absorbent pad 58. The basis weight of the
30 absorbent pad 58 can range between about 80 gsm and about 1,000 gsm. More preferably, an acquisition layer 78 is disposed in the aqueous liquid storage layer 76, which is typically moved forward on the aqueous liquid storage layer 78. The fluff pulp/SAP ratio can range from about 100:0 to about 40:60, and more typically from about 80:20 to about 50:50.

The absorbent pad 58 provides the feature of being able to transport aqueous liquid in what can be characterized as in an x- and y-direction and in a z-direction. The transport of aqueous liquid in the z-direction is movement of a wicking nature and gravity flow where the aqueous liquid moves away from the body of the wearer. The transport of aqueous liquid in the x-direction and y-direction is movement and/or wicking of aqueous liquid along the length and width of the absorbent pad 58. As can be appreciated, the movement of aqueous liquid both away from the wearer and along the length and width of the absorbent pad 58 results in an increase in the utilization of the area of the absorbent pad 58 since the aqueous liquid moves towards the distal ends of the absorbent pad 58, and the result is an improvement of the absorption characteristics of the absorbent pad 58.

As illustrated in Figures 2 and 4b, the absorbent pad 58 has a width that is measured between the side edges 62 and 64 thereof. The absorbent pad 58 has a length that is measured between the front end and the back end edges 66 and 68 thereof. The width and length of the absorbent pad 58 are each less than the corresponding width and length of the container 74 comprised of the backing member 22 and the aqueous liquid pervious body-side liner 40. The width of container 74 is measured between the side edges 26 and 28 of the garment 20 thereof, and the length of the container 74 is measured between the front and back edges 30 and 32 of the garment 20..

The overall length of the absorbent pad 58 should be adequate to help prevent aqueous liquid leakage when sleeping or sitting. This overall length is at least about 12 inches (305 mm) thus extending beyond the central region 35 along the longitudinal centerline A-A of the undergarment 20. Alternatively, the length should be in the range of about 12 inches (305 mm) to about 30 inches (762 mm), more typically ranging from about 15 inches (381 mm) to about 23 inches (584 mm). A common range is from about 15 inches (381 mm) to about 21 inches (533 mm) in length, more typically ranging from about 17 inches (432mm) to about 20 inches (508mm). Optimally, the length of the absorbent pad 58 is about 19 inches(483 mm).

The width of the absorbent pad 58 extending beyond the central region 35 should be at least as wide as the width of the absorbent pad 58 in the central region 35. The

width of the absorbent pad 58 could be narrowed beyond the central region 35 but may compromise the leakage containment. In some cases, the width of the absorbent pad 58 is widened beyond the central region 35, especially where the garment 20 includes leg cutouts 900 in the central region 35. Because the absorbent pad 58 is disposed primarily in the front region 37, the central region 35, with less in the back region 39, a position shifted forward along the longitudinal axis of the garment 20, it is understood that the leg cutouts 900 would also be shifted forward along the longitudinal axis of the garment 20 to accommodate the position of the garment 20 on the body of the wearer. The width of the absorbent pad 58 extending beyond the central region 35 is from about 2.5 inches (64 mm) to about 12 inches (305 mm), alternatively from about 4.0 inches (102 mm) to about 10 inches (254 mm). A common range is from about 5 inches (127 mm) to about 9 inches (229 mm).

The present invention contemplates various shapes of the absorbent pad 58. One preferred composite has a non-rectangular shape such as an hourglass or I-beamed shaped absorbent pad 58. Another preferred absorbent pad 58 embodiment is rectangular in shape with rounded ends. The essentially rectangular-shaped absorbent pad 58 (i.e. an hourglass shape) is more preferred since it can be squared off at the ends to provide a smoother appearance in the back of the garment 20 while providing a more comfortable body-contouring fit.

The absorbent pad 58 is positioned so as to be symmetrical about the central longitudinal axis A--A of the garment 20 and skewed forward along the central transverse axis B--B of the garment 20. In other words, the side edges 62 and 64 of the absorbent pad 58 are equi-distant from side edges 48 and 50 of the aqueous liquid pervious body-side liner 40, respectively. The front end and back end edges 66 and 68, respectively, of the absorbent pad 58 are not equi-distant from the front and back edges 44 and 46 of the aqueous liquid pervious body-side liner 40, respectively. The absorbent pad 58 is disposed primarily in the front region 37 and the central region 35. The front end edge 66 of the absorbent pad 58 is from about 5 inches (12.7 cm) to about 1 inch (2.5cm), more preferably from about 4 inches (10.2 cm) to about 2.0 inch (5.1 cm), most preferably from about 4 inches (10.2 cm) to about 1.5 inches (3.8 cm) from the front edge 30 of the garment 20. Optimally, the distance is about 3 inches (7.6 cm). The back end edge 68 of the absorbent pad 58 is from 3 inches (7.6 cm) to about 7 inches (17.8 cm) more

preferably from about 4 inches (10.2 cm) to about 7 inches (17.8 cm), most preferably from about 4.5 inches (11.4 cm) to about 7 inches (17.8 cm) from the back edge 32 of the garment 20.

5 Referring to Figures 1, 9, 10, 11, and 12, in order to further understand what is meant by a skewed forward absorbent pad 58 along the central transverse axis it is helpful to define a "skew factor" of the absorbent pad 58 which in combination with the presence of an absorbent pad 58 in which more of the length of the absorbent pad 58 is in the front region 37 than in the back region 39 (the absorbent pad 58 is not placed
10 symmetrically but is skewed forward in the garment 20) serves to define the invention. For the purposes of this invention "not placed symmetrically" means that more than about 20 mm more of the absorbent pad 58 is in the front region 37 compared to the back region 39. The skew factor is calculated using the following steps:

- 15 1. Divide the garment length into three equal regions, the front region 37, the central region 35, and the back region 39.
2. Determine what length of the absorbent pad 58 in the longitudinal or MD direction along line A-A of Figure 2 is in each region (35, 37, and 39) of the garment 20.
- 20 3. Calculate the skew factor by dividing the length of the absorbent pad 58 in the back region 39 by the sum of the lengths of the absorbent pad 58 in the front region 37 and the central region 35.

Again referring to Figures 1, 9, 10, 11, and 12, because absorbent garments 20
25 such as undergarments, diapers, briefs, pants and the like have a large range of product lengths to fit people from infants through adults, the skew factor in conjunction with the presence of more of the absorbent pad 58 in the front region 37 than the back region 39 serves to define the amount of forward skew the absorbent pad 58 for any product length. The skew factor is a function of the overall length of the absorbent pad 58 and how it is
30 placed in the disposable underpant 90, the undergarment 20 or other absorbent personal care product. Because the overall length of the disposable underpant 90 or the undergarment 20 affects how much of the pad is in the front region 37, the central region 35, and the back region 39, the skew factor is also a function of garment length. The placement of the absorbent pad 58 in any garment 20 depends on how that garment 20 is

designed to fit on the wearer's body and the ability of the manufacturing process to control placement of the absorbent pad 58. For the purposes of this invention, the skew factor can be any value less than about 0.270. For cases where none of the absorbent pad 58 is placed in the back region 39, the skew factor becomes zero. Therefore, the range of skew factors disclosed in this invention for absorbent garments 20 with the absorbent pads 58 with a greater length in the front region 37 than in the back region 39 is 0 to 0.270. For undergarment type incontinence garments 20, as shown in Figures 9 and 10, the range of skew factors is from 0 to 0.270 and more preferably from 0.1 to 0.264. For diapers (not shown), briefs (not shown), and the disposable underpant products (see Figures 11 and 12) the skew factor is preferably from 0 to 0.270, more preferably from 0 to 0.20 and most preferably from 0.07 to 0.195.

In a preferred embodiment of the invention referring to Figures 1, 2, 3a, 5, 6, and 9, the undergarment 20 has a length of 687 mm, a width of 218 mm and comprises an absorbent pad 58 which has an MD length of 483 mm and a CD width of 114mm. As shown in Figures 5 and 6, the absorbent pad 58 comprises a homogeneous mixture of 210 gsm (grams per square meter) of DOW 2035 high absorbency material 202 (available from the DOW Chemical Company, Midland MI) and 391 gsm of Alliance CR1654 fluff pulp fibers 201. There is also a carded web intake material 79 in undergarment 20 which is 305 mm long and 76 mm wide with a basis weight of 85 gsm comprising a mixture of 40% by weight 6 denier polyester fibers from Hoechst Celanese and 60% 3 denier sheath core polyethylene / polypropylene crimped fibers from CHISSO Corporation of Japan. The intake material 79 is located between the bodyside liner 40 and the absorbent pad 58. The absorbent pad 58 has a retention capacity of about 500 grams of 0.9% sodium chloride in water. Importantly, the absorbent pad 58 is placed in undergarment 20 so that the front end edge 66 of absorbent pad 58 is 76 mm from the front end edge 30 of undergarment 20. This results in 31.7% of the length of the absorbent pad 58 in the machine direction being placed in the front region 37 of the undergarment 20, 47.4% of the length of the absorbent pad 58 is in the central region 35 of the undergarment 20 and only 20.9 % of the length of the absorbent pad 58 is in the back region 39 of the undergarment 20. The skew factor of the absorbent pad 58 is 0.264 and is calculated as follows (refer to Figure 9):

1. The undergarment **20** is 687 mm long and comprises three regions, a front region **37**, a central region **35**, and a back region **39** each of which is 229 mm long which is obtained by dividing 687 by 3.

2. The absorbent pad **58** is 483 mm long and is placed 76 mm from the front end edge of the undergarment **20**. Subtracting 76 mm from 229mm (the length of the front region **37**) leaves 153 mm of the absorbent pad **58** in front region **37**.

3. Subtracting 153 mm from the total length of the absorbent pad **58** of 483 mm results in a difference of 330 mm remaining in the central region **35** and the back region **39** of the undergarment **20**. 229 mm of this length is in the central region **35**.

4. Subtracting the 153 mm of the absorbent pad **58** in the front region **37** and the 229 mm in central region **35** from the total length of the absorbent pad **58** of 483 mm gives a difference of 101 mm which is in the back region **39**.

5. The skew factor is calculated by dividing the 101 mm in the back region **39** by the sum of the 153 mm in the front region **37** and the 229 mm in the central region **35**. The result is a skew factor of 0.264.

The placement of the absorbent pad **58** is symmetric in the CD dimension of the undergarment **20** along the central longitudinal axis A-A in **Figure 2**. Furthermore, the intake material **79** is placed so that its front end edge **82** is 102 mm from the front end edge **30** of undergarment **20**. This results in 41.6% of intake material **78** being in the front region **37** and 58.4% being in the central region **35**. None of the intake material **79** is located in the back region **39**. When placed on the body of the wearer, this configuration results in a greater proportion of the absorbent pad **58** being on the anterior side of the wearer where it is more likely to be used. The undergarments **20** as shown in **Figure 8**, have a symmetric placement of the absorbent pad **58** resulting in equal placement of the absorbent pad **58** in the anterior and posterior portions of the product resulting in lower utilization of the absorbent pad **58** and unsightly and uncomfortable bulk in the back region **39**.

In another embodiment of the invention referring to **Figures 1, 2, 3a, 5, 6, and 10**, the undergarment **20** has a length of 687 mm, a width of 218 mm and comprises an absorbent pad **58** which has an MD length of 423 mm and a CD width of 156mm on the

ends and 94 mm in the cutout region 900 along line 4 - 4. The cutout region 900 is 290 mm long and is symmetrically placed starting 70 mm from the front end edge 66 and the back end edge 68 of the absorbent pad 58. The cutout area 900 does not, however, have to be symmetrically placed from the front end edge 66 and the back end edge 68. In addition, the absorbent pad 58 has a pledget 140 placed between itself and the aqueous liquid impervious backing member 22 (Figures 1 and 4). The pledget 140 is 275 mm long and 89 mm wide. The front end edge 144 of pledget 140 is 146 mm from the front end edge 30 of the undergarment 20. Referring to Figures 5 and 6, the absorbent pad 58 comprises a homogeneous mixture of 115 gsm (grams per square meter) of DOW 2035 high absorbency material 202 (available from the DOW Chemical Company, Midland MI) and 215 gsm of Alliance CR1654 fluff pulp fibers 201. There is also a carded web intake material 79 in the undergarment 20 which is 330 mm long and 76 mm wide with a basis weight of 85 gsm comprising a mixture of 40% by weight 6 denier polyester fibers from Hoechst Celanese and 60% 3 denier sheath core polyethylene / polypropylene crimped fibers from CHISSO Corporation of Japan. The intake material 79 is located between the bodyside liner 40 and the absorbent pad 58. Again referring to Figures 5 and 6, the pledget 140 comprises a homogeneous mixture of 143 gsm (grams per square meter) of DOW 2035 high absorbency material 202 (available from the DOW Chemical Company, Midland MI) and 267 gsm of Alliance CR1654 fluff pulp fibers 201. The combined retention capacity of the absorbent pad 58 and the pledget 140 is about 500 grams of 0.9% sodium chloride in water. Importantly, the absorbent pad 58 is placed in the undergarment 20 so that the front end edge 66 of the absorbent pad 58 is 74 mm from the front end edge 30 of the undergarment 20. This results in 36.6% of the length of the absorbent pad 58 in the machine direction being placed in the front region 37 of the undergarment 20, 54.1% of the length of the absorbent pad 58 is in the central region 35 of undergarment 20 and only 9.3 % of the length of the absorbent pad 58 is in the back region 39 of undergarment 20. The skew factor of the absorbent pad 58 is 0.102. The absorbent pad 58 and intake material 79 placement is symmetric in the CD dimension of the undergarment 20 along the central longitudinal axis 4-4 (see Figure 2). Furthermore, the intake material 79 is placed so that its front end edge is 99 mm from the front end edge 30 of the undergarment 20. This results in 41.6% of the length of the intake material 79 being in the front region 37 and 58.4% of the length of the intake material 79 being in the central region 35. None of the length of the intake material 79 is located in the back region 39. When placed on the body of the wearer, this configuration results in a greater

proportion of the absorbent pad 58 being on the anterior side of the wearer where it is more likely to be used. The undergarments 20 as shown in Figure 8, have a symmetric placement of the absorbent pad 58 resulting in equal placement of the absorbent pad 58 in the anterior and posterior portions of the product resulting in lower utilization of the absorbent pad and unsightly and uncomfortable bulk in the back region 39.

Referring to Figures 5, 6, and 11, in another embodiment a disposable underpant 90 has a length of 845 mm, a width of 715 mm at the ends along line 9 - 9 and a minimum width of 120 mm in the central region 35 along line 8 - 8 and comprises an absorbent pad 58 which has an MD length of 438 mm and a CD width of 153 mm at the ends and of 89 mm in the center of the leg cutout 900 along line 8 - 8. The absorbent pad 58 is placed on aqueous liquid impervious backing member 750. The absorbent pad 58 also has a high basis weight pocket region 141 which has a length of 279 mm, a width of 89 mm along line 8 - 8 and a width of 102 mm at the ends. Referring to Figures 5 and 6, the absorbent pad 58 comprises a homogeneous mixture of 129 gsm (grams per square meter) of DOW 2035 high absorbency material 202 (available from the DOW Chemical Company, Midland MI) and 215 gsm of Alliance CR1654 fluff pulp fibers 201 in the end regions 700 and 701. In the pocket region 140, the basis weight of high absorbency material 202 is 261 gsm and of fluff pulp fiber 201 is 435 gsm. There is also a carded web intake material 79 in the disposable underpant 90 which is 330 mm long and 76 mm wide with a basis weight of 85 gsm comprising a mixture of 40% by weight 6 denier polyester fibers from Hoechst Celanese and 60% 3 denier sheath core polyethylene / polypropylene crimped fibers from CHISSO Corporation of Japan. The intake material 79 is located between the bodyside liner 40 and the absorbent pad 58. The absorbent pad 58 has a retention capacity of about 500 grams of 0.9% sodium chloride in water. Importantly, the absorbent pad 58 is placed in the disposable underpant 90 so that the front end edge 710 of the absorbent pad 58 is 163 mm from the front end edge 710 of the disposable underpant 90. Furthermore, the front end edge 720 of the pocket region 141 is placed 222 mm from the front end edge 710 of the disposable underpant 90. Finally, an 85 gsm surge material (intake material) 79 with a length dimension of 279 mm and a width of 64 mm is placed coextensive with the pocket region in the length dimension and centered in the width dimension is placed on the body side of absorbent pad 58. The absorbent pad 58 has a retention capacity of about 500 grams of 0.9% sodium chloride in water. This results in 27.1 % of the length of absorbent pad 58 in

the machine direction being placed in the front region 37 of the disposable underpant 90, 64.2% of the length of the absorbent pad 58 being in the central region 35 of the disposable underpant 90 and 8.7% of the length of the absorbent pad 58 being in the back region 39 of the disposable underpant 90. The absorbent pad 58 has a skew factor of 0.095. Additionally, 21.5% of the length of the pocket region 141 is in the front region 37, 78.5% of the length of the pocket region 141 is in the central region 35 and 0.0% of the length of the pocket region 141 is in the back region 39. The absorbent pad 58 and intake material 79 placement is symmetric in the CD dimension of the disposable underpant 90 along the central longitudinal axis A-A in Figure 12. When placed on the body of the wearer, this configuration results in a greater proportion of the absorbent pad being on the anterior side of the wearer where it is more likely to be used. Compared to symmetric placement of the absorbent pad 58 in the MD length of the disposable underpant resulting in equal placement of the absorbent pad 58 in the anterior and posterior portions of the product, the skewed forward configuration described above results in higher utilization of the absorbent pad 58 and prevents unsightly and uncomfortable bulk in the back region 39 of the disposable underpant 90.

Referring to Figures 5, 6, and 12 in yet another embodiment, a disposable underpant 90 has a length of 845 mm, a width of 715 mm at the ends along line 9 - 9 and a minimum width of 120 mm in the central region along line 8 - 8 and comprises an absorbent pad 58 which has an MD length of 489 mm and a CD width of 153 mm at the ends and of 89 mm in the center of the leg cutout 900 along line 8 - 8. The absorbent pad 58 is placed on the aqueous liquid impervious backing member 750. The absorbent pad 58 also has a high basis weight pocket region 143 which has a length of 489 mm (full length of the absorbent pad 58), a width of 89 mm along line 8 - 8 and a width of 102 mm at the ends. Referring to Figures 5a and 6, the absorbent pad 58 comprises a homogeneous mixture of 114 gsm (grams per square meter) of DOW 2035 high absorbency material 202 (available from the DOW Chemical Company, Midland MI) and 232 gsm of Alliance CR1654 fluff pulp fibers 201 in the side end regions 721 and 722. In the pocket region 143, the basis weight of high absorbency material is 282 gsm and of fluff pulp 591 gsm. The absorbent pad 58 has a retention capacity of about 800 grams of 0.9% sodium chloride in water. Importantly, the absorbent pad 58 is placed in the disposable underpant 90 so that the front end edge 710 of the absorbent pad 58 is 112 mm from the front end edge 710 of the disposable underpant 90. Finally, an 85 gsm

surge material (intake material) 79 with a length dimension of 279 mm and a width of 64 mm is placed 187 mm from the front end edge 710 of the disposable underpant 90 and is centered in the width dimension along the central longitudinal axis A-A is placed on the body side of the absorbent pad 58. This results in 34.7 % of the length of the absorbent pad 58 in the machine direction being placed in the front region 37 of the disposable underpant 90, 57.6 % of the length of the absorbent pad 58 is in the central region 35 of the disposable underpant 90 and 7.7% of the length of the absorbent pad 58 is in the back region 39 of the disposable underpant 90. The absorbent pad 58 has a skew factor of 0.082. The absorbent pad 58 and intake material 79 placement is symmetric in the CD dimension of the disposable underpant 90 along the central longitudinal axis A-A. When placed on the body of the wearer, this configuration results in a greater proportion of the absorbent pad 58 being on the anterior side of the wearer where it is more likely to be used. Compared to symmetric placement of the absorbent pad 58 in the MD length of the disposable underpant 90 resulting in equal placement of the absorbent pad 58 in the anterior and posterior portions of the product, the skewed forward configuration described above results in higher utilization of the absorbent pad 58 and prevents unsightly and uncomfortable bulk in the back region 39 of the disposable underpant 90.

A leg elastic 96 has a front edge 98, a back edge 100, an exterior side edge 102 and an interior side edge 104. The leg elastic 96 is affixed adjacent the side edge 48 of the aqueous liquid pervious body-side liner 40 so as to be spaced inwardly therefrom. The leg elastic 96 is positioned so that the front edge 98 and the back edge 100 are equidistant from their respective front and back edges 44 and 46 of the aqueous liquid pervious body-side liner 40. However, the leg elastic 96 can be positioned other than in an equi-distant arrangement relative to their front and back edges 98 and 100 and the front and back edges 44 and 46 of the aqueous liquid pervious body-side liner 40. The leg elastic 96 can be positioned such that the front and back edge 98 and 100 are equidistant from the front end and back end edges 66 and 68 of the absorbent pad 58. Additionally, the leg elastic 96 can be positioned such that the front and back edges 98 and 100 are not equidistant from the front end and back end edges 66 and 68 of the absorbent pad 58.

A second leg elastic 108 has a front edge 110, a back edge 112, an interior side edge 114 and an exterior side edge 116. The leg elastic 108 is affixed to the aqueous

liquid pervious body-side liner 40 so as to be adjacent to the side edge 50 thereof, and is spaced inwardly of the side edge 50. The leg elastic 108 is positioned so that its front edge 110 and back edge 112 are spaced equi-distant from their respective front and back edges 44 and 46 of the aqueous liquid pervious body-side liner 40. The leg elastic 108 can also be positioned other than in an equi-distant arrangement. The leg elastic 108 can be positioned such that the front and back edges 110 and 112 are equi-distant from the front end and back end edges 66 and 68 of the absorbent pad 58. Additionally, the leg elastic 96 can be positioned such that the front and back edges 98 and 100 are not equidistant from the front end and the back end edges 66 and 68 of the absorbent pad 58.

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While the leg elastics 96 and 108 can be designed to closely follow the edge of the absorbent pad 58 outside of the central region 35, moving the leg elastics 96 and 108 away from the absorbent pad 58, the absorbent pad 58 interferes less with the function of the leg elastics 96 and 108, providing better gasketing around the legs of the wearer. In addition, as the absorbent pad 58 swells as it absorbs bodily discharges, the leg elastics 96 and 108 so positioned are better able to remain in contact with and conform to the wearer's body. Such a placement of the leg elastics 96 and 108 is especially beneficial in garments 20 having leg cutouts 900, as fit, protection, and comfort of the garments 20 are improved.

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In a preferred embodiment, leg elastics 96 and 108, are attached to the garment 20 sandwiched between the backing member 22 and the body-side liner 40, in generally a stretched state by means known in the art, including ultrasonic bonded, heat/pressure bonded or adhesively bonded. The leg elastics 96 and 108 are typically attached in a stretched state by means known in the art, including ultrasonic bonded, heat/pressure bonded or adhesively bonded. Materials suitable for the elastics include a wide variety including but not limited to elastic strands, yarn rubber, flat rubber, elastic tape, film-type rubber, polyurethane and elastomeric, tape-like elastomeric or foam polyurethane or formed elastic or non-elastic scrim. Suitable material is sold under the name LYCRA® by the DuPont Company located in Wilmington, Delaware. Each elastic may be unitary, multi-part or composite in construction before integrating into the garment 20.

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In an alternative embodiment, leg elastics 96 and 108, are attached to the garment 20 sandwiched between the outer member 38 and the backing member 22 in generally a

stretched state by means known in the art, such as ultrasonic bonded, heat/pressure bonded or adhesively bonded.

5 The leg elastics 96 and 108 are from about 0.0625 inch (1.6 mm) to about 1 inch (25 mm) wide, more typically from about 0.25 inch (6 mm) to about 1 inch (25 mm), and most typically from about 0.25 inch (6 mm) to about 0.75 inch (18 mm) such as 0.5 inch (13 mm). The leg elastics 96 and 108 are applied under an elongation of from about 100% to about 350%, more typically under an elongation of from about 150% to about 275%, and most typically under an elongation of from about 225% to about 275%.

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The leg elastics 96 and 108 may comprise threads, strands, ribbons, bands, film, elastic nonwovens, or composite. The threads, strands, ribbons, or bands may be multiple and may be applied as a composite. The number of pieces of elastic material comprising the leg elastic 96 and 108 ranges from about 1 to about 6, more typically from about 2 to about 5, and most typically from about 3 to about 4. Preferably, when the leg elastics 96 and 108 are threads, 1 to 6 threads are used as the leg elastics 96 and 108, and the threads are spaced from about 0.0625 inch (1.6 mm) to about 0.5 inches (13 mm), more preferably from about 0.0625 inch (1.6 mm) to about 0.25 inch (6 mm), and most preferably about 0.125 inch (3 mm) apart.

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The threads may be made of any suitable elastomeric material. One suitable material is spandex such as LYCRA® threads available from DuPont located in Wilmington, Delaware. Suitable leg elastics 96 and 108 include threads having a decitex (g/10000m) of from about 470 to about 1200, more typically from about 620 to about 1000, and most typically from about 740 to about 940 for leg elastics 96 and 108 comprising from about 3 to about 6 threads. Adhesive 118, (Figure 3) typically applied in a meltblown or swirl pattern using currently known technology, is used to bond the leg elastics 96 and 108 to the outer member 38, the body-side liner 40, or the backing member 22. Preferably the adhesive 118 is applied only to the leg elastics 96 and 108. A suitable adhesive includes, for example, Findley H2096 hot melt adhesive which is available from Ato Findley Adhesives located in Milwaukee, WI.

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In one embodiment, to provide a snug fit around the legs of the wearer and to draw up the sides of the central region 35 to form a cradle structure around the absorbent

pad 58, the leg elastics 96 and 108 are applied to the backing member 22 or the body-side liner 40 under an elongation of about 225% to about 275%. The leg elastics 96 and 108 are sandwiched between the backing member 22 and the body-side liner 40 under an elongation more preferably of about 200%.

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In another embodiment providing a snug fit around the legs of the wearer and drawing the sides of the central region 35 up to form a cradle structure around the absorbent pad 58, the leg elastics 96 and 108 are applied to the outer member 38 or the backing member 22 under an elongation of about 200% to about 250%. The leg elastics 96 and 108 are sandwiched between the outer member 38 and the backing member 22 under an elongation more preferably of about 200%.

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In some embodiments, it is desirable to generally center the leg elastics 96 and 108 between the front end edge 66 and the back end edge 68 of the absorbent pad 58.

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In the specific embodiment, the leg elastics 96 and 108 are made of urethane. However, it is contemplated that the leg elastics 96 and 108 can be made of natural rubber or other synthetic elastic material.

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When stretched for adherence to the garment 20, the leg elastics 96 and 108 have a length of about 14 inches (35.6 cm) and a width of about 0.42 inches (1.06 cm). When the leg elastics 96 and 108 relax, they each are of a length equal to about 16.5 cm and a width of about 1.27 cm.

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A pair of slits 120 and 122, such as button holes, are contained in the container 74 comprised of the aqueous liquid pervious body-side liner 40 and the aqueous liquid impervious backing member 22 adjacent the front edge 30 of the garment 20. Another pair of slits 124 and 126, such as button holes, are contained in the container 74 comprised of the aqueous liquid pervious body-side liner 40 and aqueous liquid impervious backing member 22 adjacent the back edge 32 of the garment 20. A strap 130, having retainers 132 and 134, such as buttons, each at opposite ends, extends between the slits 120 and 124. Another strap 136, having retainers 138 and 139, such as buttons, each at opposite ends, extends between the slits 122 and 126. This support

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system is described in U.S. Patent 4,315,508 issued February 16, 1982 to Bolick, which is incorporated herein by reference.

Still, other means for securing the garment around the individual includes
5 mechanical type fasteners. These include snaps, buckles, clasps, hooks and loops, end extensions, tabs, adhesive tapes and the like which are designed or adapted to interlock or engage some type of a complimentary device or the outer cover of the garment. In addition, elasticized fasteners are also used in assuring better fit of such garments. Other absorbent garments 20 may include fully encircling or pre-fastened waist bands.

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The leg elastics 96 and 108 effectively seal between the body of the wearer and the garment 20 so as to provide good containment properties in the central region 35.

15 EXAMPLES

Example # 1

Ten incontinent panelists were recruited to determine what portions of an undergarment were actually wetted in use. Each panelist was given commercially
20 available DEPEND® undergarments available from Kimberly-Clark Corporation of Dallas, Texas. The DEPEND® undergarment had a full product length of 686 mm and the absorbent pad was 534 mm long and placed symmetrically in the undergarment with the front and back end edges of the absorbent pad being 76 mm from the respective front and back end edges of the undergarment. Each product was marked on the front side so the
25 researchers would know which end was placed on the anterior portion of the body. Each panelist was instructed to wear the undergarment as they normally do, but rather than rolling them up as they normally do and discarding them, they would "box" the used product. Each box unit consisted of three major pieces: a flat piece of cardboard approximately the size of an undergarment with a peel strip down the center, a plastic
30 bag, and an outside box. The panelists were instructed to remove the peel strip and carefully place the used undergarment on it, being careful not to stretch out the undergarment but to let it reside naturally. Then they would slide the cardboard and product into the plastic bag and box. Each product had a matching diary sheet so

leakage information about that particular product was known while it was being examined. Each panelist was given four products to wear during a 24 hour period.

- Each used product was measured to determine what area of the product fit between the users legs and what the distance of the typical insult was from the front and back end edges of the absorbent pad. The results appear in the Table 1.

TABLE 1

Insult Distance Analysis

Distance from Front End Edge of Undergarment

Longitudinal Distance Range Between Users Legs (From Front End Edge of Undergarment Product)	Average Distance of Insult Wetness from Front End Edge of Absorbent Pad	Average Distance of Insult Wetness from Back End Edge of Absorbent Pad
198 to 256 mm	58 mm	211 mm

- Comparison of the data in the table to the description of the undergarment product dimensions clearly shows that the input of urine into the products is highly skewed to the front of the garment. The center point of the product is 343 mm for full product length and 267 mm for the absorbent pad. Because all of the numbers in TABLE 1 are much less than 343, it suggests that a more efficient and better performing product should have the absorbent pad concentrated more to the front.

Example #2

- Undergarments were sent to 87 incontinent panelists (65 females, 22 males) who used them under normal use conditions. A diary sheet, with pre-written questions, was provided for all individual products on which panelists recorded information pertaining to leakage. All used products were returned and weighed to determine the amount of urine they contained. From the combined data, a stepwise procedure for logistic regression was used to determine the best fitting model for the leakage data. The goal of logistic regression is to describe the relationship between leaks and the set of explanatory variables (codes, urine grams, gender, activity, and panelist hip size).

The undergarment products tested had overall dimensions of about 8.7 inches (22.1 cm) wide and 27 inches (68.6 cm) long and a design as generally shown in Figure 1 and Figure 9. The absorbent pads were all 19" in length. The pads had a ratio of 35% superabsorbent to 65% fluff fibers throughout the entire length with a target density of 0.160 g/cm³. In addition, all products had about a 3 inch (7.6 cm) wide by 12 inch (30.5 cm) long intake layer with a basis weight of 85 gsm.

Products A and B had 4.5 inches (11.4 cm) wide absorbent pads and differed in the location of the absorbent pad in relation to the front of the undergarment and in the location of the intake layer in relation to the front of the absorbent pad as shown in TABLE 2.

Products C and D had I-shaped absorbent pads with the absorbent pad being 4.5 inches (11.4 cm) at its widest part and 3.5 inches (8.9 cm) at its narrowest point. The length of the narrowed (3.5 inch) portion of the pad had a MD length of 10 inches (25.4 cm). The products differed in the location of the absorbent pad in relation to the front of the undergarment, in the location of the intake layer in relation to the front of the absorbent pad, and in the location of the 10 inch (25.4 cm) long, 3.5 inches (8.9 cm) wide, the narrowed portion of the absorbent pad, in relation to the front of the absorbent pad. As shown in TABLE 2.

TABLE 2

Absorbent Pad Length (inches)	Distance A	Distance B	Distance C
A 19	4	3.5	N/A
B 19	3	1	N/A
C 19	4	3.5	4.5
D 19	3	1	3

Distance A.

Distance from front of absorbent pad to front of undergarment (inches)

Distance B.

Distance from front of intake layer to front of absorbent pad (inches)

Distance C.

Distance from front of 3.5 inch wide narrowed portion of absorbent pad to front of absorbent pad (inches)

- 5 Referring to Figure 9, TABLE 3 uses the data in TABLE 2 to calculate the percentages of the absorbent pad 58 and the intake material 79 in the front region 37, the central region 35, and the back region 39 of the undergarment 20. The data clearly shows that codes B and D have absorbent pads 58 and intake material 79 which are much more skewed to the front of the undergarment 20 than codes A and C.

10

TABLE 3
Pad and Intake Layer Percentages
Front Region, Central Region, and Back Region

Code	Skew Factor	Absorbent Pad % In			Intake Layer % In		
		Front	Central	Back	Front	Central	Back
A	Not Skewed	26.3	47.4	26.3	10.2	75.1	14.7
B	0.264	31.7	47.4	20.9	42.0	58.0	0.0
C	Not Skewed	26.3	47.4	26.3	10.2	75.1	14.7
D	0.264	31.7	47.4	20.9	42.0	58.0	0.0

15

- The leakage probability data in TABLE 4 shows the improvements seen in leakage performance when the absorbent components, absorbent pad and intake layer, and shape are skewed forward towards the front of the undergarment. Codes B and D have the lowest leakage probabilities and Code D which also includes a highly skewed forward leg cutout region has the lowest leakage probabilities of all.

20

25

TABLE 4

Leakage Probabilities at Various Urine Loadings (grams)

	25 g	125 g	350 g
A	0.076	0.142	0.440
B	0.051	0.106	0.414
C	0.051	0.109	0.440
D	0.041	0.095	0.436

- 5 **Note:** Leakage probability is the chance that a product will leak when subjected to a given loading of urine during use. A 100% chance of leaking has a probability of 1.00.

Example #3

- 10 Two absorbent pant products were tested for leakage protection performance. Pants were sent to 72 incontinent panelists (44 females, 28 males) who used them under normal use conditions. A diary sheet, with pre-written questions, was provided for all individual products on which panelists recorded information pertaining to leakage. All used products were returned and weighed to determine the amount of urine they
- 15 contained. From the combined data, a stepwise procedure for logistic regression was used to determine the best fitting model for the leakage data. The goal of logistic regression is to describe the relationship between leaks and the set of explanatory variables (codes, urine grams, gender, activity, and panelist hip size).
- 20 The products tested were a prototype pant and the SureCare® Slip-On Undergarment produced by Inbrand Corporation of Marietta, Georgia. The Slip-on product is a traditional pant with a symmetrical placement of the absorbent material in the product chassis while the prototype had a highly skewed forward absorbent pad with less capacity than the SureCare product. The SureCare product is 660 mm long and has an
- 25 essentially rectangular absorbent pad which is 550 mm long and 127 mm wide. The absorbent pad has 90 gsm of high absorbency material and 1062 gsm of fluff pulp. The pad is placed 55 mm from the front and back end edges of the garment.

The prototype pant 90 (referring to **Figure 11**) has a product length of 781 mm. The absorbent pad is 400 mm long and 165 mm wide at the ends and 90 mm wide in the center. The pad is placed 160 mm from the front end edge of the pant and 221 mm from the back end edge of the pant. The pad comprises 110 gsm of high absorbency material and 165 gsm of fluff fibers. In addition, the prototype has a pledget which is 292 mm long, 90 mm wide and placed 185 mm from the front end edge of the pant and 304 mm from the back end edge of the pant between the absorbent pad and the backing member. The pledget is comprised of 180 gsm of high absorbency material and 270 gsm of fluff fibers. The density of the pad and pledget is about 0.160 gm / cc. In addition, the prototype has a 100 gsm intake material which is 64 mm wide and 203 mm long. The front end edge of the intake material is 216 mm from the front end edge of the pant prototype and 362 mm from the back end edge of the pant.. The proportions of the absorbent pads and pledgets in the front region, central region, and back region are shown in Table 5. Table 5 shows that the absorbent pad, pledget, and intake material of the prototype are skewed to the front of the product with higher proportions of the absorbent in the front while the SureCare product has symmetric placement of its absorbent pad.

TABLE 5

Dimensional Comparison of Prototype and SureCare Slip-On

Product	Absorbent Component	% in Front Region	% in Central Region	% in Back Region	Retention Capacity 0.9% Saline
SureCare	Absorbent Pad	30.0	40.0	30.0	726 g
Prototype	Absorbent Pad	25.0	65.0	9.8	480 g
	Pledget	25.7	74.3	0.0	
	Intake Layer	21.2	78.8	0.0	

The SureCare product in TABLE 5 does not have a skew factor because it is symmetric. On the other hand, the skew factor of the prototype absorbent pad is 0.111 showing it to be highly skewed forward.

The leakage information in TABLE 6, expressed as the urine load in grams at which 20% (LD20) and 50% (LD50) of the products leak clearly shows that the pant

prototype with the skewed forward absorbent provides better leakage protection because a higher urine load is needed to make 20% and 50% of the products leak.

TABLE 6

5 Leakage Protection of SureCare Slip-on versus Prototype Pant

Product	Gender	LD20, grams	LD50, grams
SureCare	Male	240	367
	Female	84	231
Prototype	Male	294	450
	Female	294	441

10 While various patents and other reference materials have been incorporated herein
by reference, to the extent there is any inconsistency between incorporated material and
that of the written specification, the written specification shall control. In addition, while the
invention has been described in detail with respect to specific embodiments thereof, it will
be apparent to those skilled in the art that various alterations, modifications and other
changes may be made to the invention without departing from the spirit and scope of the
15 present invention. It is therefore intended that the claims cover all such modifications,
alterations and other changes encompassed by the appended claims.

We claim:

1. A disposable, absorbent garment defining an initial expanded shape having longitudinal and transverse axes, a front region, a back region, said front region and said back region being generally oppositely disposed on said longitudinal axis and a central region disposed between said front region and said back region, wherein said front region, said back region, and said central region each having a length along the longitudinal axis of one third of the length of said absorbent garment and comprising:
- a aqueous liquid-impervious backing member;
 - 10 a aqueous liquid pervious body-side liner joined to said backing member approximate a periphery of said joined body-side liner and backing member;
 - 15 a generally rectangular absorbent pad, having a front end edge and a back end edge, positioned between said bodyside liner and said backing member in board of said periphery of said joined liner and said backing member; and,
 - 20 elastic gathers aligned along longitudinally extending margins of said periphery, rendering said garment elastically contractible and body-conforming adjacent the crotch of the wearer,
- wherein said absorbent pad is disposed within said regions such that the length of said absorbent pad in the back region divided by the length of said absorbent pad in said front region and said central region is less than 0.27 and said length of said absorbent pad in said front region is greater than said length of absorbent pad in said back region.
2. The disposable, absorbent garment according to Claim 1, wherein said absorbent garment further comprises a front waist region, a back waist region, said front waist region and said back waist region being generally oppositely disposed on said longitudinal axis and a crotch region disposed between said front waist region and said back waist region.

3. The disposable, absorbent garment according to Claim 2, wherein said front waist region further comprises a front edge and said back waist region further comprises a back edge.
4. The disposable, absorbent garment according to Claim 3, wherein said front end edge of said absorbent pad is disposed from about 7 inches to about 3 inches from said front edge of said front waist region and said back end edge of said absorbent pad is disposed from about 4 inches to about 10 inches from said back edge of said back waist region.
- 5 5. The disposable, absorbent garment according to Claim 4, wherein said absorbent pad is positioned symmetrically relative to said longitudinal axis.
6. The disposable, absorbent garment according to Claim 1, wherein the length of said absorbent pad is from about 15 inches to about 21 inches.
7. The disposable, absorbent garment according to Claim 2, wherein the length of said absorbent pad is from about 15 inches to about 21 inches.
8. The disposable, absorbent garment according to Claim 1, wherein the length of said absorbent pad is from about 55 percent to about 80 percent of the length of said backing member.
9. The disposable, absorbent garment according to Claim 1, wherein said garment has a generally rectangular shape.
10. The disposable, absorbent garment according to Claim 1, wherein said garment has a generally rectangular shape with leg cutouts.

- 11.** The disposable, absorbent garment according to Claim 1, wherein said garment further comprises a surge layer disposed between said absorbent pad and said body-side liner.
- 12.** The disposable, absorbent garment according to Claim 1, wherein said garment further comprises a surge layer disposed between said absorbent pad and said body-side liner, said surge layer being positioned symmetrically relative to the longitudinal axis of the expanded garment and dimensioned to have a length and width less than the length and width of said absorbent pad.
- 13.** The disposable, absorbent garment according to Claim 1, wherein said absorbent pad has a generally rectangular shape.
- 14.** The disposable, absorbent garment according to Claim 1, wherein said absorbent pad has a generally I shaped.
- 15.** The disposable, absorbent garment according to Claim 1, wherein said garment further comprises a generally rectangular pledget disposed between said absorbent pad and said backing member, said pledget being positioned symmetrically relative to said longitudinal and transverse axes of the expanded garment and dimensioned to have a length and width less than the length and width of said backing member, wherein said pledget, said elastic gathers and said absorbent pad function together to form a cup-shaped portion adjacent the crotch of the wearer when said garment is worn.
- 16.** The disposable, absorbent garment according to Claim 15, wherein said garment further comprises a surge layer disposed between said absorbent pad and said body-side liner.
- 17.** The disposable, absorbent garment according to Claim 15, wherein said garment further comprises a surge layer disposed between said absorbent pad and said body-side liner, said surge layer being positioned symmetrically relative to the longitudinal axis of the

expanded garment and dimensioned to have a length and width less than the length and
5 width of said absorbent pad.

18. The disposable, absorbent garment according to Claim 1, wherein said garment
further comprises a generally rectangular pledget disposed between said absorbent pad
and said backing member, said pledget being positioned symmetrically relative to said
longitudinal axis of the expanded garment and dimensioned to have a length and width
5 less than the length and width of said absorbent pad, wherein said pledget, said elastic
gathers and said absorbent function together to form a cup-shaped portion adjacent the
crotch of the wearer when said garment is worn.

19. The disposable, absorbent garment according to Claim 18, wherein said garment
further comprises a surge layer disposed between said absorbent pad and said body-side
liner.

20. The disposable, absorbent garment according to Claim 18, wherein said garment
further comprises a surge layer disposed between said absorbent pad and said body-side
liner, said surge layer being positioned symmetrically relative to the longitudinal axis of the
expanded garment and dimensioned to have a length and width less than the length and
width of said absorbent pad.

21. A disposable, absorbent garment defining an initial expanded shape having
longitudinal and transverse axes, a front region, a back region, said front region and said
back region being generally oppositely disposed on said longitudinal axis and a central
region disposed between said front region and said back region, wherein said front region,
5 said back region, and said central region each having a length along the longitudinal axis
of one third of the length of said absorbent garment and comprising:

a aqueous liquid-impervious backing member;

- 10 a aqueous liquid pervious body-side liner joined to said backing member
approximate a periphery of said joined body-side liner and backing
member;
- 15 a generally rectangular absorbent pad, having a front end edge and a back end
edge, positioned between said bodyside liner and said backing member in
board of the periphery of said joined liner and said backing member,
wherein said absorbent pad is positioned symmetrically relative to said
longitudinal axis; and,
- 20 elastic gathers aligned along longitudinally extending margins of said periphery,
rendering said garment elastically contractible and body-conforming
adjacent the crotch of the wearer,

25 wherein said absorbent pad is disposed within said regions such that the length of said
absorbent pad in the back region divided by the length of said absorbent pad in said front
region and said central region is less than 0.27 and said length of said absorbent pad in
said front region is greater than said length of absorbent pad in said back region.

22. The disposable, absorbent garment according to Claim 21, wherein said absorbent
garment further comprises a front waist region, a back waist region, said front waist region
and said back waist region being generally oppositely disposed on said longitudinal axis
and a crotch region disposed between said front waist region and said back waist region.

23. The disposable, absorbent garment according to Claim 22, wherein said front
waist region further comprises a front edge and said back waist region further comprises a
back edge.

24. The disposable, absorbent garment according to Claim 23, wherein said front end
edge of said absorbent pad is disposed from about 5 inches to about 1 inch from said
front edge of said front waist region and said back end edge of said absorbent pad is
disposed from about 3 inches to about 7 inches from said back edge of said back waist
region.

- 25.** The disposable, absorbent garment according to Claim 21, wherein the length of said absorbent pad is from about 12 inches to about 30 inches.
- 26.** The disposable, absorbent garment according to Claim 22, wherein the length of said absorbent pad is from about 12 inches to about 30 inches.
- 27.** The disposable, absorbent garment according to Claim 21, wherein the length of said absorbent pad is from about 30 percent to about 100 percent of the length of said backing member.
- 28.** The disposable, absorbent garment according to Claim 21, wherein said garment has a generally rectangular shape.
- 29.** The disposable, absorbent garment according to Claim 21, wherein said garment has a generally rectangular shape with leg cutouts.
- 30.** The disposable, absorbent garment according to Claim 21, wherein said garment further comprises a surge layer disposed between said absorbent pad and said body-side liner.
- 31.** The disposable, absorbent garment according to Claim 21, wherein said garment further comprises a surge layer disposed between said absorbent pad and said body-side liner, said surge layer being positioned symmetrically relative to the longitudinal axis of the expanded garment and dimensioned to have a length and width less than the length and width of said absorbent pad.
- 32.** The disposable, absorbent garment according to Claim 21, wherein said absorbent pad has a generally rectangular shape.

- 33.** The disposable, absorbent garment according to Claim 21, wherein said absorbent pad has a generally I shaped.
- 34.** The disposable, absorbent garment according to Claim 21, wherein said garment further comprises a generally rectangular pledget disposed between said absorbent pad and said backing member, said pledget being positioned symmetrically relative to said longitudinal and transverse axes of the expanded garment and dimensioned to have a
5 length and width less than the length and width of said backing member, wherein said pledget, said elastic gathers and said absorbent pad function together to form a cup-shaped portion adjacent the crotch of the wearer when said garment is worn.
- 35.** The disposable, absorbent garment according to Claim 34, wherein said garment further comprises a surge layer disposed between said absorbent pad and said body-side liner.
- 36.** The disposable, absorbent garment according to Claim 34, wherein said garment further comprises a surge layer disposed between said absorbent pad and said body-side liner, said surge layer being positioned symmetrically relative to the longitudinal axis of the expanded garment and dimensioned to have a length and width less than the length and
5 width of said absorbent pad.
- 37.** The disposable, absorbent garment according to Claim 21, wherein said garment further comprises a generally rectangular pledget disposed between said absorbent pad and said backing member, said pledget being positioned symmetrically relative to said longitudinal axis of the expanded garment and dimensioned to have a length and width
5 less than the length and width of said absorbent pad, wherein said pledget, said elastic gathers and said absorbent function together to form a cup-shaped portion adjacent the crotch of the wearer when said garment is worn.

38. The disposable, absorbent garment according to Claim 37, wherein said garment further comprises a surge layer disposed between said absorbent pad and said body-side liner.

39. The disposable, absorbent garment according to Claim 37, wherein said garment further comprises a surge layer disposed between said absorbent pad and said body-side liner, said surge layer being positioned symmetrically relative to the longitudinal axis of the expanded garment and dimensioned to have a length and width less than the length and width of said absorbent pad.

40. A disposable, absorbent garment defining an initial expanded shape having longitudinal and transverse axes, a front region, a back region, a central region, wherein said front region and said back region being generally oppositely disposed on said longitudinal axis and said central region disposed between said front region and said back region and wherein said front region, said back region, and said central region each having a length along the longitudinal axis of one third of the length of said absorbent garment, a front waist region, a back waist region, and a crotch region, wherein said front waist region and said back waist region being generally oppositely disposed on said longitudinal axis and said crotch region disposed between said front waist region and said back waist region, and wherein said front waist region further comprises a front edge and said back waist region further comprises a back edge, and comprising:

a aqueous liquid-impervious backing member;

a aqueous liquid pervious body-side liner joined to said backing member approximate a periphery of said joined body-side liner and backing member;

a generally rectangular absorbent pad, having a front end edge and a back end edge, positioned between said bodyside liner and said backing member in board of the periphery of said joined liner and said backing member, wherein said absorbent pad is positioned symmetrically relative to said longitudinal axis, wherein said front end edge of said absorbent pad is

25 disposed from about 5 inches to about 1 inch from said front edge of said front waist region and said back end edge of said absorbent pad is disposed from about 3 inches to about 7 inches from said back edge of said back waist region; and,

30 elastic gathers aligned along longitudinally extending margins of said periphery, rendering said garment elastically contractible and body-conforming adjacent the crotch of the wearer,

wherein said absorbent pad is disposed within said regions such that the length of said absorbent pad in the back region divided by the length of said absorbent pad in said front
35 region and said central region is less than 0.27 and said length of said absorbent pad in said front region is greater than said length of absorbent pad in said back region.

41. The disposable, absorbent garment according to Claim 40, wherein said absorbent garment further comprises a front waist region, a back waist region, said front waist region and said back waist region being generally oppositely disposed on said longitudinal axis and a crotch region disposed between said front waist region and said back waist region, and wherein said front waist region further comprises a front edge and said back waist region further comprises a back edge.

42. The disposable, absorbent garment according to Claim 40, wherein the length of said absorbent pad is from about 12 inches to about 30 inches.

43. The disposable, absorbent garment according to Claim 41, wherein the length of said absorbent pad is from about 12 inches to about 30 inches.

44. The disposable, absorbent garment according to Claim 40, wherein the length of said absorbent pad is from about 30 percent to about 100 percent of the length of said backing member.

- 45.** The disposable, absorbent garment according to Claim 40, wherein said garment has a generally rectangular shape.
- 46.** The disposable, absorbent garment according to Claim 40, wherein said garment has a generally rectangular shape with leg cutouts.
- 47.** The disposable, absorbent garment according to Claim 40, wherein said garment further comprises a surge layer disposed between said absorbent pad and said body-side liner.
- 48.** The disposable, absorbent garment according to Claim 40, wherein said garment further comprises a surge layer disposed between said absorbent pad and said body-side liner, said surge layer being positioned symmetrically relative to the longitudinal axis of the expanded garment and dimensioned to have a length and width less than the length and
5 width of said absorbent pad.
- 49.** The disposable, absorbent garment according to Claim 40, wherein said absorbent pad has a generally rectangular shape.
- 50.** The disposable, absorbent garment according to Claim 40, wherein said absorbent pad has a generally I shaped.
- 51.** The disposable, absorbent garment according to Claim 40, wherein said garment further comprises a generally rectangular pledget disposed between said absorbent pad and said backing member, said pledget being positioned symmetrically relative to said longitudinal and transverse axes of the expanded garment and dimensioned to have a
5 length and width less than the length and width of said backing member, wherein said pledget, said elastic gathers and said absorbent pad function together to form a cup-shaped portion adjacent the crotch of the wearer when said garment is worn.

- 52.** The disposable, absorbent garment according to Claim 51, wherein said garment further comprises a surge layer disposed between said absorbent pad and said body-side liner.
- 53.** The disposable, absorbent garment according to Claim 51, wherein said garment further comprises a surge layer disposed between said absorbent pad and said body-side liner, said surge layer being positioned symmetrically relative to the longitudinal axis of the expanded garment and dimensioned to have a length and width less than the length and width of said absorbent pad.
- 54.** The disposable, absorbent garment according to Claim 40, wherein said garment further comprises a generally rectangular pledget disposed between said absorbent pad and said backing member, said pledget being positioned symmetrically relative to said longitudinal axis of the expanded garment and dimensioned to have a length and width less than the length and width of said absorbent pad, wherein said pledget, said elastic gathers and said absorbent function together to form a cup-shaped portion adjacent the crotch of the wearer when said garment is worn.
- 55.** The disposable, absorbent garment according to Claim 54, wherein said garment further comprises a surge layer disposed between said absorbent pad and said body-side liner.
- 56.** The disposable, absorbent garment according to Claim 54, wherein said garment further comprises a surge layer disposed between said absorbent pad and said body-side liner, said surge layer being positioned symmetrically relative to the longitudinal axis of the expanded garment and dimensioned to have a length and width less than the length and width of said absorbent pad.
- 57.** A disposable, absorbent garment defining an initial expanded shape having longitudinal and transverse axes, a front region, a back region, a central region, wherein said front region and said back region being generally oppositely disposed on said

10 longitudinal axis and said central region disposed between said front region and said back
region and wherein said front region, said back region, and said central region each
having a length along the longitudinal axis of one third of the length of said absorbent
garment, a front waist region, a back waist region, and a crotch region, wherein said front
waist region and said back waist region being generally oppositely disposed on said
15 longitudinal axis and said crotch region disposed between said front waist region and said
back waist region, and wherein said front waist region further comprises a front edge and
said back waist region further comprises a back edge, and comprising:

20 a aqueous liquid-impervious backing member, said backing member being of a
generally rectangular configuration and having a width between about 4
inches and about 10 inches and a length between about 20 inches and
about 30 inches;

25 a aqueous liquid pervious body-side liner having similar dimensions as said
backing member and joined to said backing member approximate a
periphery of said joined body-side liner and backing member;

30 a generally rectangular absorbent pad, having a front end edge and a back end
edge, positioned between said bodyside liner and said backing member
in board of the periphery of said joined liner and said backing member,
and having a width between about 40 percent and about 90 percent of
the width of said backing member; and,

35 elastic gathers aligned along longitudinally extending margins of said periphery,
rendering said garment elastically contractible and body-conforming
adjacent the crotch of the wearer,

40 wherein said absorbent pad is disposed within said regions such that the length of said
absorbent pad in the back region divided by the length of said absorbent pad in said front
region and said central region is less than 0.27 and said length of said absorbent pad in
said front region is greater than said length of absorbent pad in said back region.

1/7

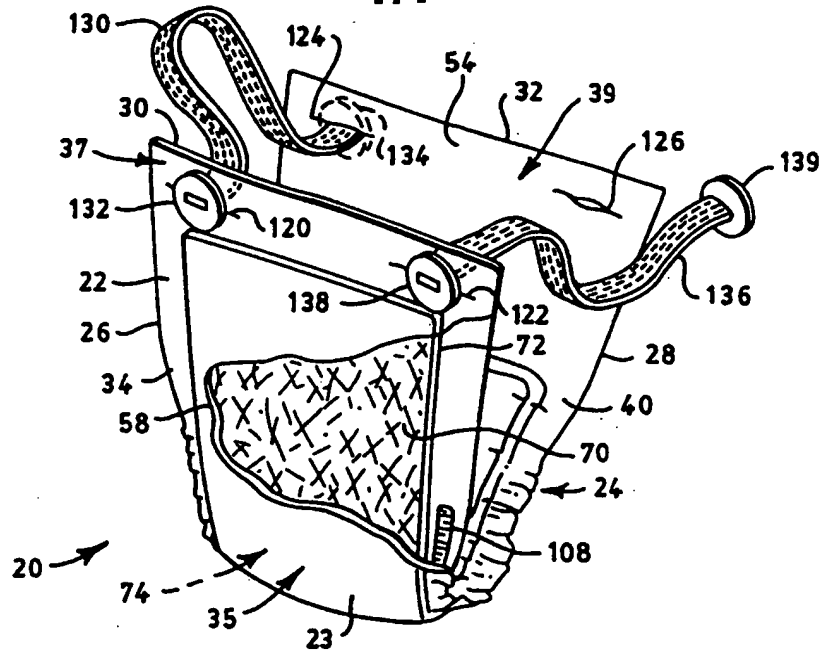


FIG. 1

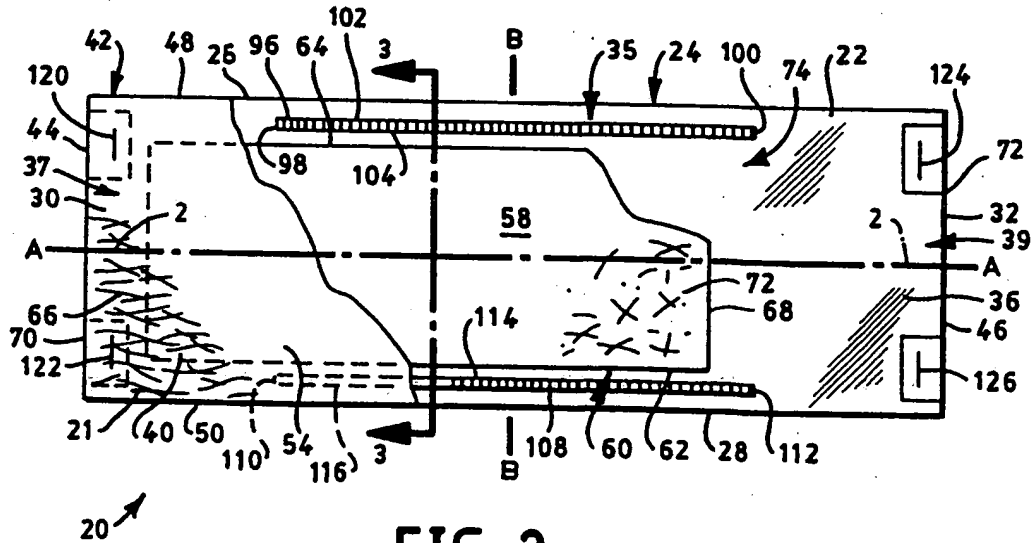


FIG. 2

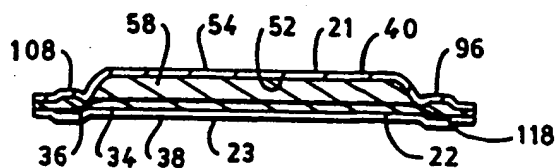


FIG. 3

[illegible]

FIG. 4B

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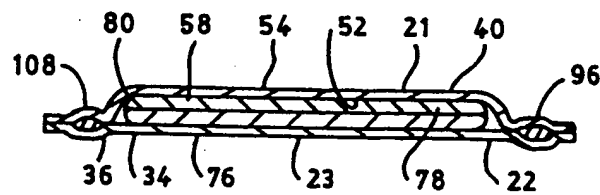


FIG. 3A

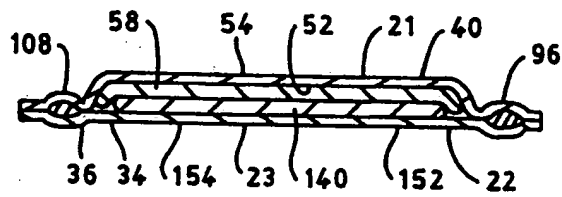


FIG. 4C

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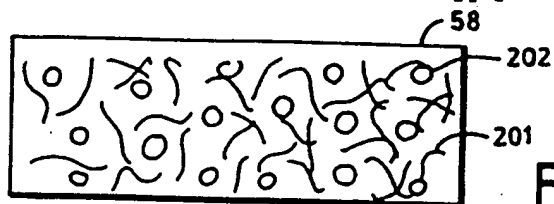


FIG. 5

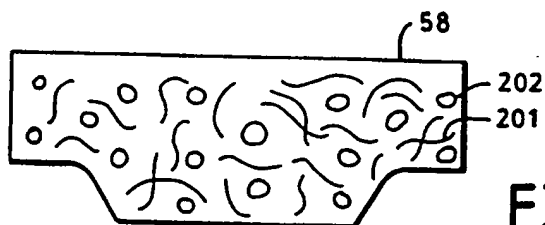


FIG. 5A

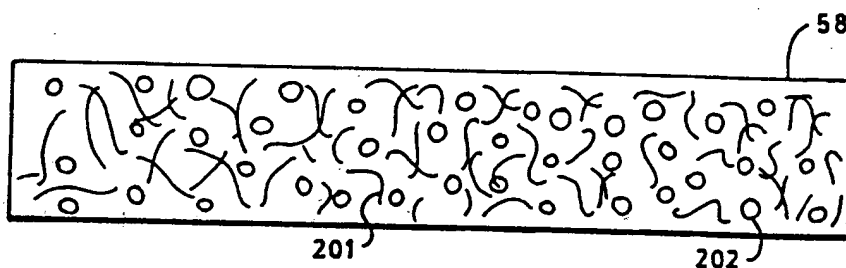


FIG. 6

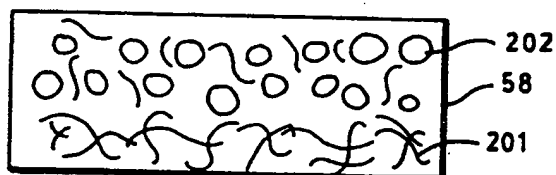


FIG. 7

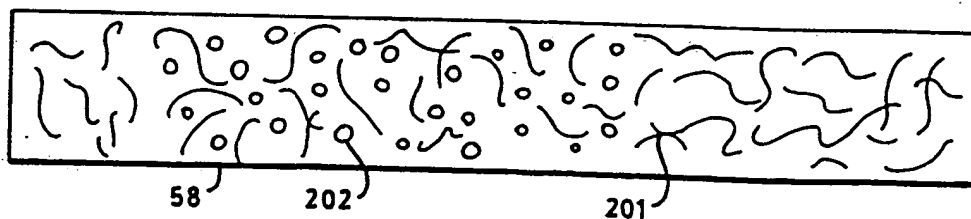


FIG. 7A

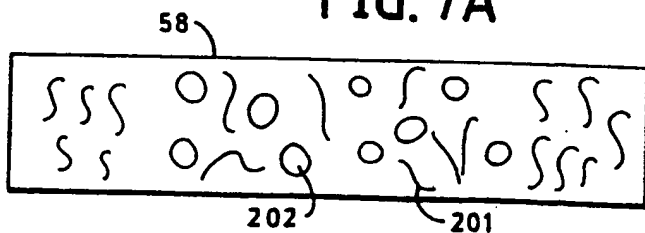


FIG. 7B

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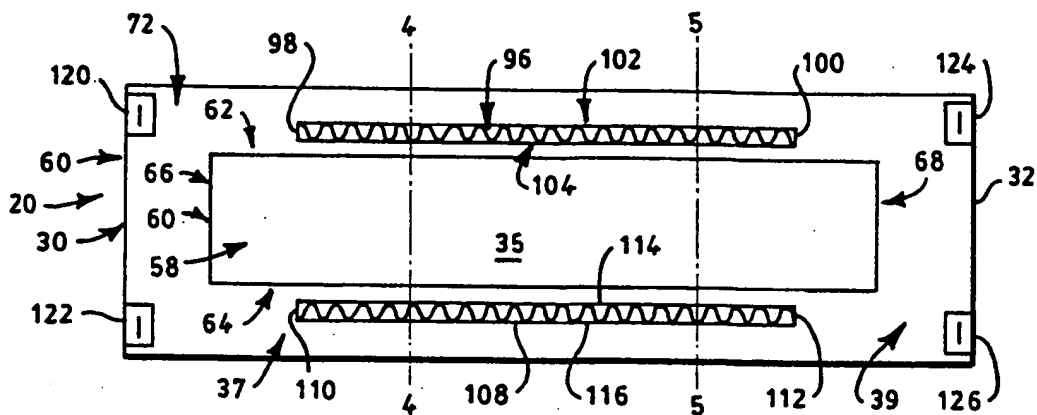


FIG. 8

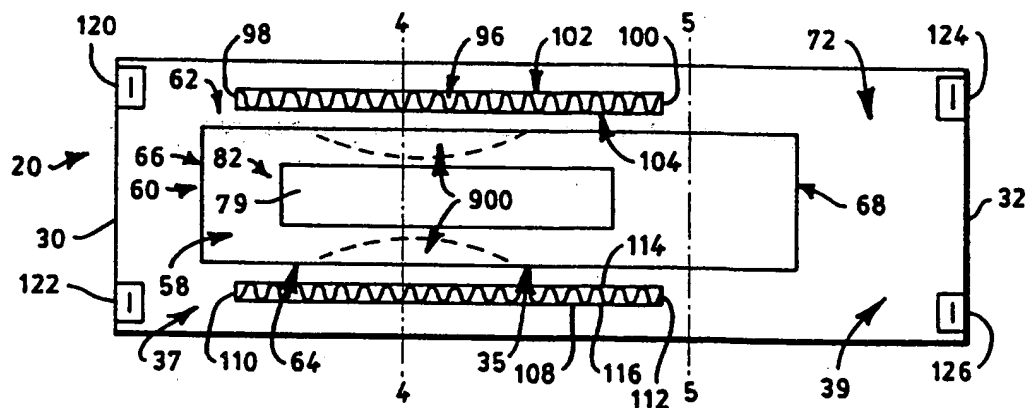


FIG. 9

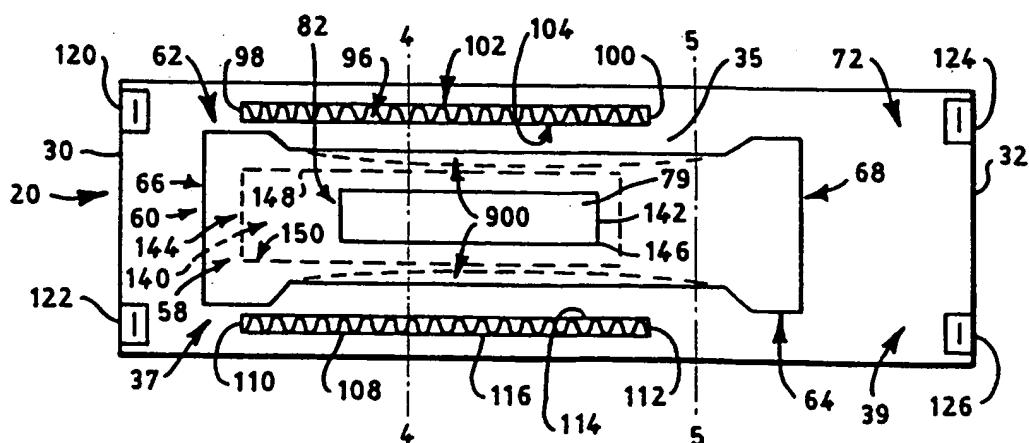


FIG. 10

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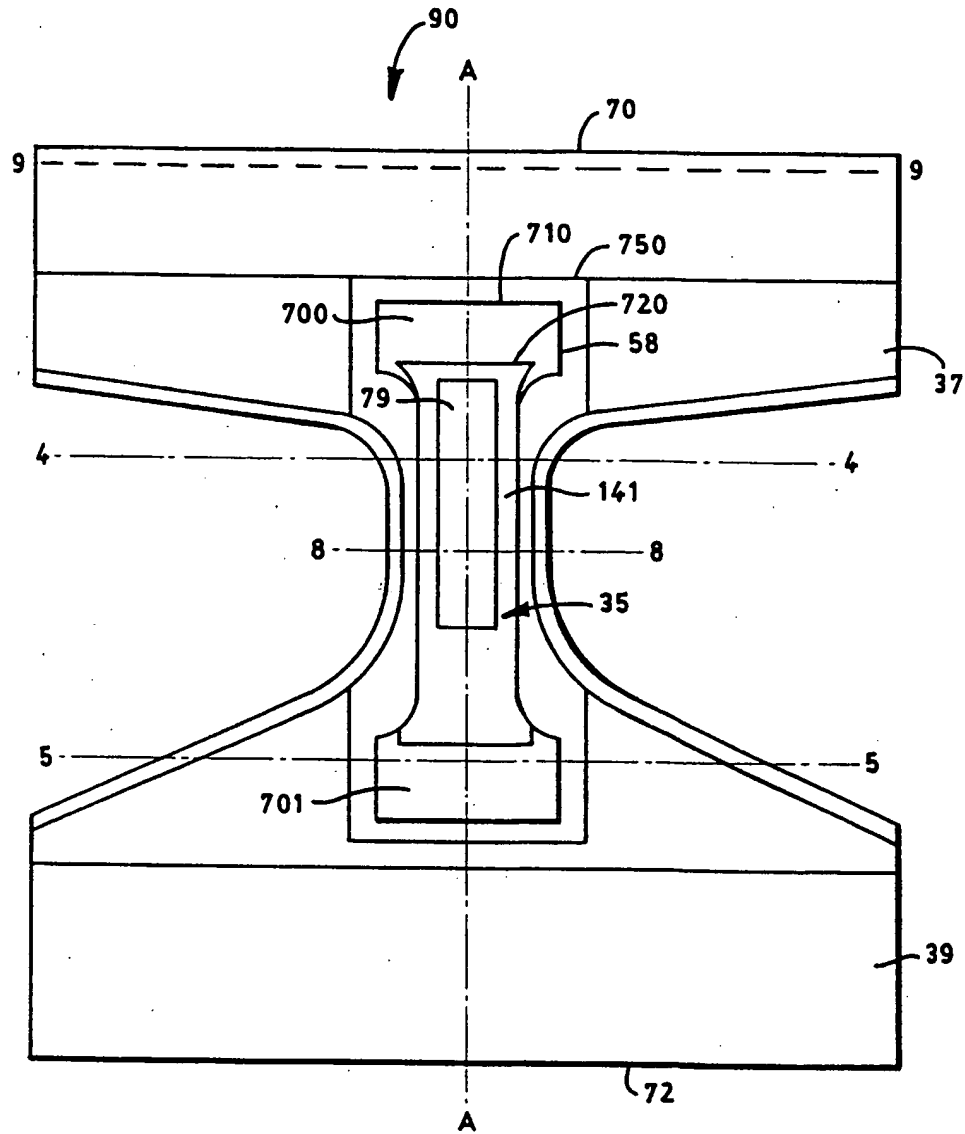


FIG. 11

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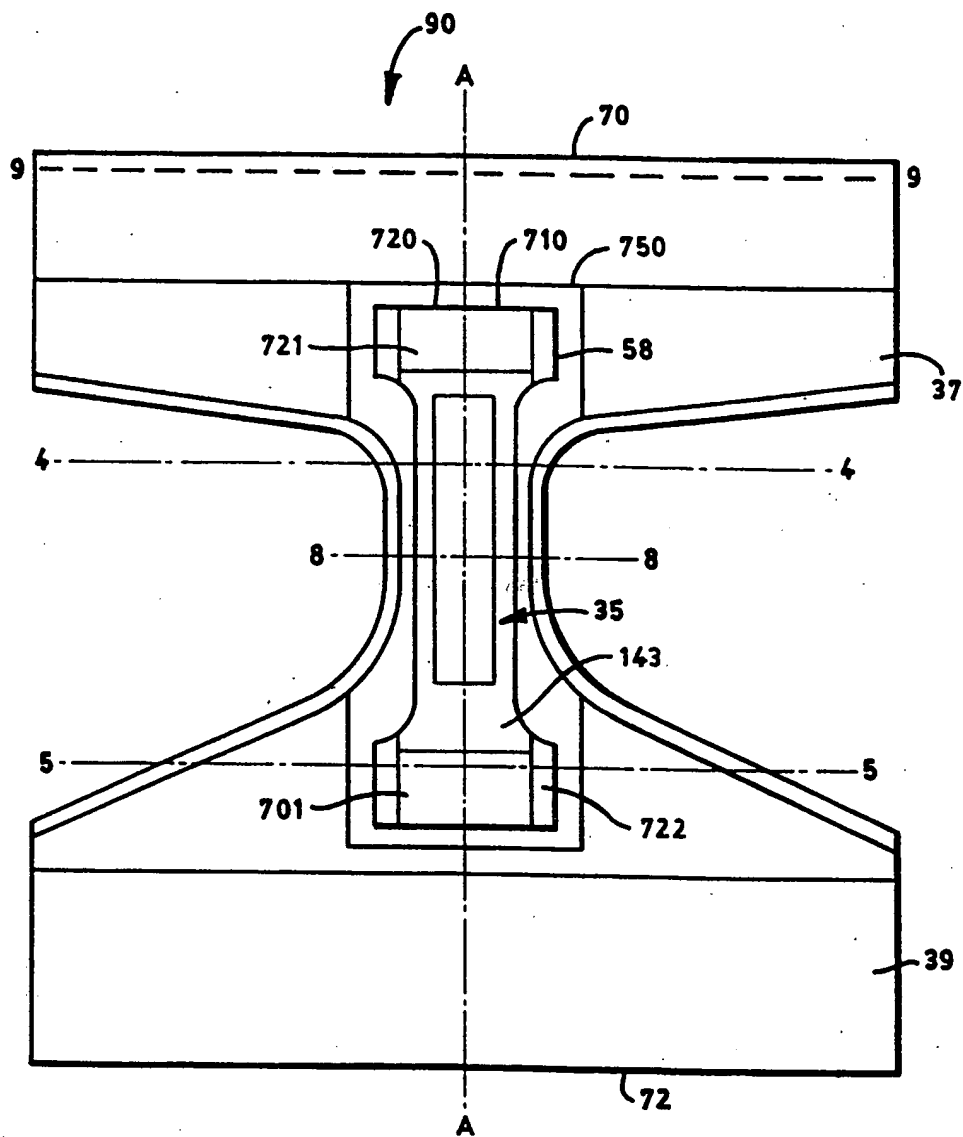


FIG. 12